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ABSTRACT

This resource manual provides information on adaptive technology for students with deaf-blindness and severe disabilities. The material is based on a project that sought to identify specific applications that support the acquisition of early communication and social interaction skills. The first section describes 20 computer software programs and adaptations, both commercial and public domain, that can facilitate the use of microcomputers by students with deaf-blindness and severe disabilities. Each review includes: information on the publisher, purposes, possible modifications, and a ranking of the "user-friendly features" of the program; additional rank-ordered information on the range of programs, graphics, options, and reinforcers; and a vignette describing how the program was adapted for and used by a student. The second section consists of resource lists of peripheral equipment and adaptive devices, commercially available software for Apple II computers, public domain software, resources for public domain software, hardware and software warehouses, technology resources, publications, and bulletin boards and user groups. The final section presents annotated bibliographies addressing adaptive technology in general; microcomputer technology in the classroom; technology and augmentative communication; and microcomputers, switch access, and environmental control. (JDD)

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Technological Resources for Students with Deaf-Blindness and Severe Disabilities

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Technological Resources for Students with Deaf-Blindness and Severe Disabilities

Technological advances over the past two decades, and especially within the last few years, have greatly affected the evolution and expansion of adaptive equipment, including computer hardware and software. Among many other things, this growth in adaptive devices has contributed to increased opportunities for students with severe disabilities. For example, a student with severe physical impairments can participate in a computer-based activity by accessing the program via a switch; a student with visual impairments can work on the computer with auditory feedback; a student with severe cognitive disabilities can use the computer to increase an understanding of cause-effect relationships; and, yet another student can utilize microcomputer technology to access a speech synthesized communication board, thereby increasing opportunities to communicate independently with peers in the classroom.

The intended functions of technology for students with deaf-blindness and severe disabilities should be no different than they are for other learners. Namely, technology can help to promote greater autonomy or environmental control; facilitate the performance of tasks; provide a means for increased social integration; and help build upon previously acquired concepts and skills. Yet, for students with severe physical, cognitive, or dual sensory impairments, the concern exists that microcomputer technology is often used inappropriately or in a manner unrelated to the student's educational goals. It is recognized that technology cannot "cure" disabilities or change inefficient skills to functional competencies; however, there is a consensus among professionals that certain forms of technology, delivered with appropriate, well planned, and purposeful interventions, can greatly have an impact on learning and educational programs. Individualized goals and carefully planned implementations of microcomputer-based activities can serve as the means to supplement and/or support other forms of instruction; ultimately, it can help students with the severest disabilities achieve educational growth and independence, as it does their peers without disabilities.

However, even with the philosophical understanding and appreciation for these new applications of technology, many questions persist as to the practical issues regarding implementation of computer activities in the classroom. These include concerns such as how a teacher can best adapt a program to meet specific student needs; how a computer activity can be structured to maximize social interaction between two students; and, how technology supports the acquisition of skills targeted on a student's Individualized Education Plan. The following material is based upon the premise that a one's ability to

locate technology resources, identify and select appropriate software, and remain knowledgeable as an informed consumer will help to maximize the success and appropriateness of a student's time engaged in technology-based activities.

The overall purpose of this manual is to provide information on adaptive technology. This manual is designed for educators, speech-language pathologists, parents, and other persons who currently use technology or are interested in learning more about specific applications. This material is based, in part, on a research project that aimed to identify, demonstrate, and validate the uses of technology for preschool and school-age children with deaf-blindness and severe disabilities. The focus of this project was on the identification of specific applications that support the acquisition of early communication and social interaction skills.

Several people have contributed to various stages of the following material. We are grateful for the assistance and support provided by these individuals and would like to thank Carol Brandt, Wendy Buckley, Martha Harville, and Fran Schuster for their efforts. The development of this material was supported in part by Grant #H086G90014 which was awarded to the Developmental Disabilities Center, St. Luke's/Roosevelt Hospital Center, from the United States Department of Education, Office of Special Education and Rehabilitative Services. This material does not necessarily reflect the policies or opinions of the U.S. Department of Education and no official endorsement should be inferred. Reprints of this material are available from the Center for Adaptive Technology, Inc. (15 West 65th Street, NY, NY 10023).

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Technological Resources for Students with Deaf-Blindness and Severe Disabilities

Software Review

Software Review

The overall purpose of this section, the Software Review, is to provide information on various computer software programs and adaptations that can facilitate the use of microcomputers by students with deaf-blindness and severe disabilities. Twenty programs, both commercial and public domain, have been reviewed. Each review includes a vignette describing how the program was adapted for and used by a student having deaf-blindness or severe disabilities. The research project from which this material developed emphasized the development of social interaction and communication skills in students with deaf-blindness and severe disabilities. As a result, the following material addresses how adaptive technology devices and software can supplement and enhance the development of specific skills.

Each review includes three pages: Page 1 provides general information on the publisher, purposes, possible modifications, and rank-orders the "user-friendly features" of the program; Page 2 provides additional rank-ordered information on the range of programs, graphics, options, and reinforcers; and, Page 3 presents the case example or vignette. The terms below provide detailed explanations of each category.

Definition of Terms

Purposes: provide a general description of the overall aim of the program and describes the academic and/or cognitive content area addressed.

Modifications: cover types of adaptive equipment used to access the program or run the software. Possible modifications include: switch (with jack or AFC); alternative or adaptive keyboard; joystick; speech synthesizer; mouse; Touch Window; and PowerPad.

"User-Friendly" Features: pertain to accessibility of certain program features. "Set up" is the time and effort required to boot-up, organize, and prepare the program (e.g., does the student need to wait several minutes for the program to be ready; does the teacher need to switch disks or enter a lengthy amount of information to get started?). "On screen instruction" refers to availability and quality of instructions on the monitor. "Printed Manual/Documents" address the clarity, extent of information, and suggested teaching activities of the documentation that accompanies the program. "Storing data" addresses the capability and ease with which the program records the 'score' or student progress.

"Speed controls" include options to control program speed or material presented on the monitor. "Instructional Quality" rates the overall quality of material presented within the program.

Software Subprograms: address the variety and range of "subprograms" available on disk. "Subprograms" refer specifically to the extent of options available from the main menu (e.g., are there several choices or only one?). "Range of Content" refers to the variation of topics and available within the larger program. "Skill Levels" address the range of instructional levels.

Graphic Design: refers to the overall visual presentation and display. "Print/ Font" is the type, size, boldness, and general quality of written words or letters on the monitor. "Color/Contrast" refers to the quality of color images, as well as the ability to make changes without going into the computer's control panel. "Clarity" refers to the overall quality of the image or picture presented. "Animation" is the quality of movement.

Student Options: explain the degree of choices and options that are available when using the program. These include: "Interactive Programming" (deciding what comes next in the program; choosing a certain path which will have a new or different outcome); "Peer Interaction" (e.g., the number of players for a particular game or program; ease with which a teacher can structure turn-taking); and, "Individualization" (e.g., choosing the number of trials; setting specific variables for different students).

Reinforcers/Feedback: covers the general feedback, reinforcers, and motivation to continue working with the program. "Auditory feedback" refers to sounds or words given for correct and incorrect responses; "Visual feedback" refers to any type of graphic image as reinforcer; "Printed record" and "Scorekeeping" refer to two aspects of recordkeeping and data collection.

CATCH THE COW

Publisher: Public Domain
(check with various warehouse and resource agencies)

Phone:

Target Audience: Pre-school to Primary Grades

Computer Compatibility: Apple II series

Cost: $ 3 to 5 -- depending upon place of purchase

Purposes: This program addresses skills related to scanning (horizontally and vertically) and visual tracking. As the cow moves across the screen, the student is required to press the switch. Scanning difficulty increases as the user progresses through the program. A "pretest" is available to assess optimal scanning rate (from 1-20 seconds).

Modifications: (possible interface options and use with adaptive equipment)

Switch (with AFC or adapter)
Joystick
Keyboard (or alternative keyboard)

Open apple key substitutes for switch.

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	4	0	Easy
On screen instruction	Hard/None	1	2	3	4	0	Easy
Printed Manual/Documents	Hard/None 0	1	2	3	4	5	Easy
Storing data	Hard/None 0	1	2	3	4	5	Easy
Speed controls	Hard/None	1	2	3	4	0	Easy
Instructional Quality	Hard	1	2	3	0	5	Easy

Data can not be stored to disk, but can be printed immediately following user's session. Instructions on screen include teacher options for controlling rate of scan. [Control L] stops the program at any point and offers a printed record of user's skills during the session.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1		3	4	5	Many
Range of Content	No options	1		3	4	5	Many
Skill Levels	No options	1	2		4	5	Many

Four levels of scanning difficulty range from 2 boxes (horizontal scan) to an array of 36 boxes (requiring horizontal and vertical scan). Programs on disk are the pretest & game. Captured cows are lined up on the bottom of the screen (e.g., can address counting skills).

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1		3	4	5	High
Color/Contrast	Low quality	1	2		4	5	High
Clarity	Low quality	1	2	3		5	High
Animation	Low quality	1		3	4	5	High

Visual images (the cow and arrow) are fairly small.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options		2	3	4	5	Many
Peer Interaction	No options		2	3	4	5	Many
Individualization	No options	1		3	4	5	Many

Turn taking can be structured by teacher. The student can choose to use one or two switches, depending on whether mode is set to automatic or manual scanning.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1		3	4	5	Many
Visual feedback	No options	1	2		4	5	Many
Printed record	No options	1	2	3	4		Many
Scorekeeping	No options	1	2	3	4		Many

Captured cow changes color from orange to green and moves to bottom of screen (as feedback when the switch is pressed accurately). Scorekeeping includes average response time, fastest & slowest time, number of trials, & recommended time for auto scanning.

Case Example

Software: Catch the Cow

Walter, who is ten years old, is learning how to use an electronic augmentative communication device which requires scanning. Walter can physically access a standard keyboard with the assistance of an adapted pointer (which he grasps in his hand), but he is just beginning to understand the concept of scanning. Many of his educational and communication goals are currently focusing on teaching him to press a switch or button at a specific time, and he is also trying to increase his rate of response. At this point, his teachers, parents, and therapists are more concerned with helping Walter learn the concepts behind scanning than they are with his physical access, since when he gets physically tired from isolating his index finger, a pointer can be used to assist him. Learning and improving on the cognitive tasks required for scanning will serve as basic skill for his ability to use an augmentative communication device.

Walter currently communicates by pointing to pictures on a communication board, but is very motivated by the voice output of an electronic device. His parents are excited about the increased independence an electronic device offers, since currently someone always has to help Walter get his listener's attention before he can use his communication system.

This program provides Walter with another activity in which he can practice his scanning skills. It is especially useful for his teachers and therapists, so that they can easily monitor his rate of response, looking specifically at how quickly he presses the switch when the image appears in the box.

CREATURE ANTICS

Publisher:	Laureate Learning Systems 110 East Spring Street Winooski, VT 05404-1837
Phone:	800-562-6801; 802-655-4755
Target Audience:	students with low cognitive skills
Computer Compatibility:	Apple II series; IIgs; IBM; Tandy
Cost:	$75 ($65 for Apple II series); preview available; replacement policy

Purposes: This program is designed to teach and reinforce cause and effect skills via a single switch. The program uses five different "creatures" which dance and move on the screen when the user presses a single switch or Touch Window. Speech synthesis provides an auditory cue to press the switch.

Modifications: (possible interface options and use with adaptive equipment)

Switch (with AFC or adapter)	Keyboard (or alternative keyboard)
Touch Window	Speech synthesizer (required)

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	4	0	Easy
On screen instruction	Hard/None	1	2	3	4	0	Easy
Printed Manual/Documents	Hard/None	1	2	0	4	5	Easy
Storing data	Hard/None0	1	2	3	4	5	Easy
Speed controls	Hard/None0	1	2	3	4	5	Easy
Instructional Quality	Hard	1	2	3	4	0	Easy

This program is very easy to set up. The input method (single switch or Touch Window) is selected by simply activating the selected equipment. There are no options for storing data or speed controls.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3	4		Many
Range of Content	No options		2	3	4	5	Many
Skill Levels	No options		2	3	4	5	Many

The main menu allows the user to choose one of five different "creatures" for animation.

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1	2	3	4		High
Color/Contrast	Low quality	1	2	3	4		High
Clarity	Low quality	1	2	3	4		High
Animation	Low quality	1	2	3	4		High

Colorful characters are presented on a black background, which helps to direct the student's visual attention to the action. The animation is creative and fun.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options		2	3	4	5	Many
Peer Interaction	No options	1	2		4	5	Many
Individualization	No options		2	3	4	5	Many

Turn taking activities can be structured by the teacher. The student can choose which character to animate by pointing to it on the Touch Window.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1	2	3	4		Many
Visual feedback	No options	1	2	3	4		Many
Printed record	No options	1	2	3	4	5	Many
Scorekeeping	No options	1	2	3	4	5	Many

Speech synthesis prompts if there is a delay in pressing the switch or Touch Window. The animation provides good visual feedback. There is no printed record or scorekeeping.

Case Example

Software: Creature Antics

Tamara is a seven year old girl with both hearing and vision impairments. She currently communicates using a 3-D object communication system and has a some receptive sign language vocabulary. Tamara has a severe cognitive delay. She tends to be interested in activities for only a very short period of time. Her educational goals have a strong emphasis on language and communication development. Many activities are structured to increase her expressive and receptive sign vocabulary as well as to increase her interest and attention to objects and people in her environment.

When Tamara uses this program, her teacher connects a 3" round yellow switch to the Adaptive Firmware Card (AFC). The switch is draped over the front of the monitor to facilitate Tamara's visual attention and focusing on the monitor (versus requiring her to look down to press the switch, in which case she would tend to lose her focus on the monitor and "wander" to the desk or ground). In addition to increasing her attention to the monitor, positioning the switch in this manner further provides Tamara with a more immediate understanding of the cause-effect relationship (e.g., hitting the switch makes the creature dance).

The first creature appears as an orange character on a black background. These vivid colors help Tamara to focus on the action and on the screen. After pressing her switch, the character immediately comes to life and dances briefly, then stops. This prompts Tamara to press the switch again to continue the action. When she doesn't respond her teacher intervenes, signs "more", and lightly prompts Tamara on the elbow to touch the switch. The session is over after a few minutes, and Tamara goes on to something else. However, the session is repeated a few times each day, and the length of the session is slightly increased each time. This approach of offering several brief sessions throughout the day allows Tamara to gradually build her attention span with a highly motivating and stimulating activity. At the same time, she is also increasing her understanding of cause-effect, which will ultimately help her as she develops communication skills. With this program, Tamara begins to see that her actions can control her environment.

THE DANCER

Publisher: Public Domain
(check with various warehouse and resource agencies)

Phone:

Target Audience: Pre-school to Primary Grades

Computer Compatibility: Apple II series

Cost: $ 3 to 5 -- depending upon place of purchase

Purposes: This program is designed to promote a basic understanding of contingency awareness. Input is via a single switch (or the apple key on the standard keyboard). Auditory and visual stimuli provides the user with immediate feedback, thereby reinforcing the concept of a cause-effect relationship.

Modifications: (possible interface options and use with adaptive equipment)

Switch (with AFC or adapter) Keyboard (or alternative keyboard)
Joystick

Open-apple key on the standard keyboard can be used in place of a single switch.

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	4	0	Easy
On screen instruction	Hard/None	1	2	3	4	0	Easy
Printed Manual/Documents	Hard/None0	1	2	3	4	5	Easy
Storing data	Hard/None0	1	2	3	4	5	Easy
Speed controls	Hard/None	0	2	3	4	5	Easy
Instructional Quality	Hard	1	2	3	4	0	Easy

Set up options include the selection of how many measures of music (1, 2, 4, or 8) will be played from a single press of the switch. One measure corresponds to exactly one switch press; four or eight measures result in a longer amount of feedback from one press. This program promotes the development of very basic cause-effect skills.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3	4	5	Many
Range of Content	No options		2	3	4	5	Many
Skill Levels	No options		2	3	4	5	Many

There are minimal options within the program and no subprograms are available.

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1		3	4	5	High
Color/Contrast	Low quality	1	2	3		5	High
Clarity	Low quality	1	2	3		5	High
Animation	Low quality	1		3	4	5	High

The dancing boy appears large on the screen and in bright colors.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options		2	3	4	5	Many
Peer Interaction	No options		2	3	4	5	Many
Individualization	No options	1		3	4	5	Many

Turn-taking and interaction can be structured by the teacher. Individualization is minimal and consists of changing the measures of music per switch press.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1	2		4	5	Many
Visual feedback	No options	1	2		4	5	Many
Printed record	No options	1	2	3	4	5	Many
Scorekeeping	No options	1	2	3	4	5	Many

The dancing music is age-appropriate for students beyond the preschool level.

Case Example

Software: The Dancer

Elaine is a five year old girl who attends a half-day kindergarten program. She has severe multiple disabilities, including limited vision and limited range of motion in her upper and lower extremities. Elaine communicates with nonconventional gestures and facial expressions. She sometimes reaches toward and pats another person's hand or arm to indicate "more". Her teachers are trying to increase the consistency with which she performs this communicative behavior. Elaine localizes to bright light and becomes very excited when she hears music. In the classroom, Elaine tends to be very passive and does not indicate a preference for which type of activity she would like to participate in, who she would like to work or play with, and whether she would like more of a particular activity or is finished.

When the Dancer program is activated, Elaine lifts her head and localizes to the image on the computer monitor. She was initially encouraged by her teacher to indicate that she wanted "more" by reaching over and patting the teacher's arm. Once Elaine began to do this with some degree of consistency, and it was clear that she understood the communicative nature of her action, her teacher introduced a small light touch switch which required only a minimal amount of pressure to activate. With consultation from the occupational therapist, the switch was placed towards the right side of her wheelchair tray, which enabled Elaine to use her most physically reliable motor movements. The aim of connecting a switch to this particular program was to increase Elaine's ability to independently activate and control an object in her environment as well as to increase her expressive communication and ability to indicate "more". The next step will be to use the switch as an object cue representing the computer and, paired with a second highly motivating activity and object cue, give Elaine choices for classroom activities.

EARLY GAMES FOR YOUNG CHILDREN

Publisher:	Springboard Software, Inc. 7808 Creekridge Circle Minneapolis, MN 55435
Phone:	612-944-3912
Target Audience:	Preschool to Primary Grades
Computer Compatibility:	Apple II series; IBM/Tandy; and PC compatibles
Cost:	$39.99 (user can make own backup copy)

Purposes: This software is designed to teach early reading and math skills. The program games specifically address letter and number identification (matching); counting; adding single digit numbers; subtracting single digit numbers; sequencing letters in alphabetical order; spelling a specific word; and graphics.

Modifications: (possible interface options and use with adaptive equipment)

Keyboard (or alternative keyboard)

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	4	0	Easy
On screen instruction	Hard/None	1	2	3	4	0	Easy
Printed Manual/Documents	Hard/None	1	2	3	4	0	Easy
Storing data	Hard/None 0	1	2	3	4	5	Easy
Speed controls	Hard/None 0	1	2	3	4	5	Easy
Instructional Quality	Hard	1	2	3	4	0	Easy

An instruction booklet comes with the program and includes activities for carry over of concepts. The menu flashes on screen and the user presses the [return] key to access the specific program. The [ctrl] [W] keys change the menu from pictures to words. Sound is turned on/off by [ctrl] [S]. The [esc] key returns to the menu. To review on-screen instruction, press [ctrl] [I] keys simultaneously.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3	4		Many
Range of Content	No options	1	2		4	5	Many
Skill Levels	No options	1	2		4	5	Many

Various activities make this program appropriate for different students (e.g., from basic matching to identification, addition, or spelling). The main menu includes: match numbers; count; add; subtract; match letters; ABC; names; compare shapes; and picture draw.

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1	2	3	4		High
Color/Contrast	Low quality	1	2	3	4		High
Clarity	Low quality	1	2	3	4		High
Animation	Low quality	1	2	3		5	High

Colors are bright and images are clear. The bird (appearing when there is a correct answer) is animated and moves about the screen.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options		2	3	4	5	Many
Peer Interaction	No options		2	3	4	5	Many
Individualization	No options	1		3	4	5	Many

The "Names" program allows any word to be programmed for spelling and typing.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1	2	3	4	5	Many
Visual feedback	No options	1	2	3		5	Many
Printed record	No options		2	3	4	5	Many
Scorekeeping	No options	1	2	3	4	5	Many

A little bird appears on the screen when a correct answer has been made. For some programs (e.g., addition), incorrect answers are corrected by a flashing number.

Case Example

Software: Early Games

Bobby is a ten year old boy who has severe cerebral palsy with some hearing and visual impairments as well. He uses a wheelchair to move about, and when he is in the classroom, he uses a lap tray. Bobby has a limited range of motion. He is learning to spell a few words, including his name, and is also learning to match and identify letters and numbers.

Since Bobby is learning the letters of the alphabet, he uses an adapted keyboard with an overlay that has the "keys" laid out in alphabetical order. To facilitate accurate reaching and pressing, the keyboard is placed on wedges at approximately a 30° angle. This provides enough of a slant for Bobby to see, reach for, and press the keys. The keys are 2 inches big, and sectioned into blocks of approximately five letters each. Each group of letters is color-coded, to provide additional visual and memory cues for finding the correct letters. For example, ABCDE are grouped together in a line, outlined, and highlighted in yellow; FGHIJ are highlighted in blue; KLMNO are highlighted in green; and so forth. His teacher used the Adaptive Firmware Card to program the keyboard, and added speech output as an extra reinforcer. Therefore, when Bobby presses the letter /B/ on his keyboard, the speech synthesizer speaks the sound "B".

Bobby uses several different programs on the Early Games disk. For his particular needs, and since this adapted overlay includes only letter keys, he works on the "Letter Matching", "ABC", and the "Spell Name" activities. His teacher is planning on making a second overlay with numbers, which he will be able to use for the matching numbers and counting games.

EXPLORE-A-STORY
WHERE DID MY TOOTHBRUSH GO?

Publisher:	D.C. Heath & Company 125 Spring Street Lexington, MA 02173
Phone:	617-860-1847
Target Audience:	Elementary Grades
Computer Compatibility:	Apple II series
Cost:	$100 (includes 5 storybooks, backup disk, and program guide)

Purposes: This is one in a series of the Explore-A-Story programs designed to simulate reading and writing skills by allowing students to create their own animated stories. Characters, props, and a variety of backgrounds are available to make creative multi-page storybooks (which can then be printed). Creative use of the program can support the teaching of cause-effect skills, group interaction, vocabulary development, matching, and comprehension activities.

Modifications: (possible interface options and use with adaptive equipment)

Switch (with AFC or adapter)
Joystick
Mouse
Keyboard (or alternative keyboard)
Touch Window

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	0	5	Easy
On screen instruction	Hard/None	1	2	3	4	5	Easy
Printed Manual/Documents	Hard/None	1	2	3	0	5	Easy
Storing data	Hard/None	1	2	3	4	0	Easy
Speed controls	Hard/None	1	2	3	4	5	Easy
Instructional Quality	Hard	1	2	3	4	0	Easy

Set-up options include basic story with or without text, and "story starters" to stimulate writing of new stories. The input method is automatically accepted by the program.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3	4		Many
Range of Content	No options	1	2	3	4		Many
Skill Levels	No options	1	2	3	4		Many

Teacher creativity allows this program to be used for a wide range of activities, addressing a variety of levels and skills.

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1	2	3		5	High
Color/Contrast	Low quality	1	2	3	4		High
Clarity	Low quality	1	2	3		5	High
Animation	Low quality	1	2	3		5	High

Some graphics are animated. The program uses colorful objects and backgrounds. Clutter can be eliminated by deleting some graphics or changing backgrounds.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options	1	2	3	4		Many
Peer Interaction	No options	1	2	3	4		Many
Individualization	No options	1	2	3	4		Many

Group activity, turn taking, and decision making can be incorporated. The student can control outcomes by the design of the story.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1	2	3	4	5	Many
Visual feedback	No options	1	2	3	4		Many
Printed record	No options	1	2	3	4		Many
Scorekeeping	No options	1	2	3	4	5	Many

Stories can be printed or saved to disk. There is no auditory feedback.

Case Example

Software: Where Did My Toothbrush Go?

Paul is a 10 year old boy who enjoys using the computer, especially with his classmates. Due to congenital rubella, he has severe vision and hearing loss as well as cognitive delays. He communicates primarily through sign language. However, since his signs are generally approximations, they are difficult for the unfamiliar person to understand. Paul has a beginning sight word vocabulary. His teacher is using this program to help refine his signing skills (e.g., by having him talk about, identify, and manipulate common household objects on the computer screen) and to increase opportunities for social interaction with his peers.

Paul uses this program with either his teacher or a classmate. The joystick is plugged into the Apple IIgs computer and placed in front of Paul, and the keyboard is moved aside. The monitor is at eye level and the room lights are dimmed to enhance contrast. Throughout the program, different scenes of the house appear, filled with familiar objects. Paul is asked to name objects such as "cat", "chair", etc. The joystick is used to move objects around the screen. Paul signs what is happening in the story. He and his partner take turns changing the story by moving the characters and objects, all the while using this as a language experience and to practice his sign vocabulary. Paul's teacher takes this opportunity to help Paul form the signs more clearly as he identifies specific objects on the screen.

During other sessions when Paul and a classmate are using the program together, his teacher introduces a set of cards with simple sentences written on them. His classmate takes the cards, which have an action sentence that they must complete (e.g., The cat is on the chair). Once his classmate completes the action on the computer (e.g., using the joystick to move the cat to the chair), Paul signs a description of what happened. In this way, the two students can interact with each other and work on the same program, addressing different skills.

For other students, simply moving the objects across the screen with the joystick can provide a stimulating cause and effect activity. In addition, this program can help develop visual-motor and tracking skills.

FIRE ORGAN

Publisher: Public Domain
(check with various warehouse and resource agencies)

Phone:

Target Audience: Any age

Computer Compatibility: Apple II series

Cost: $ 3 to 5 -- depending upon place of purchase

Purposes: The main purpose of this program is to promote cause-effect understanding. The program utilizes vivid, colorful, and changing geometric designs which appear on the computer monitor after a letter or number key is pressed.

Modifications: (possible interface options and use with adaptive equipment)

Keyboard (or alternative keyboard) Switch (with AFC)

A scanning array can be set up with the Adaptive Firmware Card (array set to inverse scanning at the fastest speed), which allows user to press switch to activate scanning and release switch to randomly pick a letter or number.

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	4	0	Easy
On screen instruction	Hard/None	0	2	3	4	5	Easy
Printed Manual/Documents	Hard/None0	1	2	3	4	5	Easy
Storing data	Hard/None0	1	2	3	4	5	Easy
Speed controls	Hard/None0	1	2	3	4	5	Easy
Instructional Quality	Hard	1	2	3	0	5	Easy

This is a good program for teaching or reinforcing cause-effect skills. It is very basic; the spacebar serves to "freeze" the picture and when pressed a second time, "releases" the image. Any letter or number key can be selected to change the picture.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3	4	5	Many
Range of Content	No options	1	2	3	4	5	Many
Skill Levels	No options	1		3	4	5	Many

The program is appropriate for user's of any age. With creativity and use of an adapted keyboard, this program can be used not only for cause-effect, but also as a means of reinforcing skill addressed on the keyboard (e.g., discrimination; letter identification; number identification; etc.) .

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality		--not applicable--				High
Color/Contrast	Low quality	1	2	3	4		High
Clarity	Low quality	1	2	3		5	High
Animation	Low quality	1	2	3	4		High

The images on the screen are similar to a "light show". Some images are more visual than others (e.g., the [S] key gives large, bright bars of color).

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options	1	2		4	5	Many
Peer Interaction	No options		2	3	4	5	Many
Individualization	No options		2	3	4	5	Many

Turn-taking can be structured; with an adaptive keyboard the program can be individualized.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1	2	3	4	5	Many
Visual feedback	No options	1	2	3	4		Many
Printed record	No options	1	2	3	4	5	Many
Scorekeeping	No options	1	2	3	4	5	Many

There is no sound with this program.

Case Example

Software: Fireorgan

Eric is a 15 year old young man who attends an educational program emphasizing functional skill development. Eric has both severe hearing loss as well as a progressive visual loss. He is currently able to see some images, although his functional vision is decreasing. Eric communicates expressively through sign language. His receptive communication is through tactile signing (e.g., an interpreter or communication partner signing into his hands). Eric's educational program is also emphasizing braille, which he is just beginning to learn.

Eric has used Fire Organ both during assessment and for drill and practice with tactile discrimination tasks. When Eric was initially assessed to determine his potential for learning braille, this program was used with an adapted overlay on the Unicorn Expanded Keyboard. His teacher made an overlay with various tactile cues (representing raised dots). The keyboard was divided into 32 squares, with different numbers of dots per square, ranging from 1 to 5. Using the Adaptive Firmware Card (AFC), the keyboard was programmed so that the desired keys (only keys with 3 dots) activated the program and all other keys (e.g., those with any other number of dots) froze the screen. Specific keys were identified prior to programming. The room lights were turned off so as to maximize contrast on the computer monitor. The tactile overlay was placed on top of the keyboard and secured with masking tape. Eric was told to find and press any key with three dots. When he did, the program was activated and bright images appeared on the screen. If he pressed any other keys, the picture on the screen stopped moving.

Once Eric understood the basic concept, additional overlays were used to teach braille letters and numbers. For example, one overlay was developed to teach letters A-H. Using the initial program developed on the AFC, his teacher was able to simply place the new overlay on the keyboard and tell him to find the specific letter (e.g., "E"). Eric was able to independently practice learning this skill while his classmates worked on other computer tasks.

FIRST CATEGORIES

Publisher:	Laureate Learning Systems 110 East Spring Street Winooski, VT 05404-1837
Phone:	800-562-6801; 802-655-4755
Target Audience:	Preschool to school age
Computer Compatibility:	Apple IIgs, Apple II series, IBM, and Tandy
Cost:	$225 ($200 for the II series); preview available; replacement policy for 2 years from time of purchase

Purposes: This program is designed to facilitate vocabulary development and increase categorization skills. The program trains and tests noun categories. Six categories are identified (animals, body parts, clothes, utensils, vehicles) and three instructional options are available to guide the learning activity. The student is prompted with visual and auditory cues to identify one of three items which is a member of a specific category. Other skill areas targeted by this program include left-right scanning; visual discrimination; visual memory; and picture-word identification.

Modifications: (possible interface options and use with adaptive equipment)

Switch (with AFC or adapter)	Keyboard (or alternative keyboard)
Joystick	Speech synthesizer (required)
Touch Window	

"User-Friendly" Features: (teacher access for set-up & implementation; rate 1-5 with 0)

Set up	Hard	1	2	3	4	0	Easy
On screen instruction	Hard/None	1	2	3	4	0	Easy
Printed Manual/Documents	Hard/None	1	2	3	4	0	Easy
Storing data	Hard/None	1	2	3	4	0	Easy
Speed controls	Hard/None	1	2	0	4	5	Easy
Instructional Quality	Hard	1	2	3	4	0	Easy

The summary of student responses (e.g., scanning time; response time) are displayed on the screen, and data can be stored on disk or printed. Set up options include choice of two or three pictures on screen, speech, and animation.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3		5	Many
Range of Content	No options	1	2		4	5	Many
Skill Levels	No options	1	2		4	5	Many

Scanning time and parameters can be altered. Choice of three levels include Review (e.g., "A dog is an animal"), Inclusion ("Which one is an animal?"), and Exclusion (e.g., "Which is not an animal?")

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1	2	3	4		High
Color/Contrast	Low quality	1	2	3	4		High
Clarity	Low quality	1	2	3	4		High
Animation	Low quality	1	2	3	4		High

Graphics are animated. Clarity of graphics and voice quality on the Echo is excellent.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options	1	2	3		5	Many
Peer Interaction	No options	1		3	4	5	Many
Individualization	No options	1		3	4	5	Many

Peer interaction activities can be structured by teacher (such as turn-taking); student selects correct choice, given verbal (through speech synthesizer) and visual (picture appearing on monitor) prompt.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1	2	3	4		Many
Visual feedback	No options	1	2	3	4		Many
Printed record	No options	1	2	3	4		Many
Scorekeeping	No options	1	2	3	4		Many

"Yes" appears on the screen with auditory feedback for correct responses. Jack-in-the-Box provides good visual feedback (jumps up and down), and a visual cue (red triangle) is used to initially indicate correct answer. This program is good for students with visual and hearing impairments.

Case Example

Software: First Categories

Karen is a student who is 10 years old. She has multiple disabilities including a mild hearing loss and visual impairment. She communicates mostly through a combination of sign language and gestures, but her vocabulary is quite limited. Karen also has used a picture communication board to indicate her needs. Her educational goals emphasize communication development with regard to increasing her expressive and receptive vocabulary. Karen is learning to identify and label objects.

When Karen uses this program, her teacher first sets the Adaptive Firmware Card for switch input, and connects the 5" round switch. The room lights are dimmed to maximize visual contrast from images on the computer monitor. Karen is seated directly in front of the computer, with the monitor at eye-level. The Echo is resting on top of the monitor. Karen can control the volume through the Echo.

A set of line drawings for all words are kept in a notebook, with plastic covering that is easily manipulated by teacher, and arranged by category (animals, foods, body parts, utensils, clothes, vehicles). The drawings are in black and white, and are very bold. When the specific picture appears on the screen, the teacher can flip to a page of the notebook and take out the corresponding line drawing of that picture. The teacher holds up the picture near the computer monitor and provides a verbal cue (e.g., "Which one is the same? Which one is ____?"). For Karen, who is just beginning to learn categories but still needs reinforcement in other skills and concepts, this adaptation allows her to work on categorization as well as matching skills and the concept of same-different. If extra cues are needed, the teacher slowly moves the line drawing picture to the selected picture on the monitor. When the red arrow points to the selected picture, Karen is given a verbal prompt to press the switch ("Yes--these are the same. They are both ___."). Review of the line drawing pictures and pictures on the computer monitor serve to increase receptive vocabulary.

Social interactions can be structured by the teacher, such as when Karen and another student are paired together to work on this program. The teacher asks "Whose turn is next?" and the two students respond by indicating either "my turn" or "her turn". The students pass the switch back and forth to each other. With the adaptations described above and with teacher guidance, the two students can work on different skills. While Karen uses the line drawing pictures to reinforce notions of matching and same-different, her partner is using the program for straight categorization.

FIRST LETTER FUN

Publisher: Minnesota Educational Computing Corporation (MECC)
3490 Lexington Avenue North
St. Paul, MN 55126

Phone: 612-481-3500

Target Audience: Preschool-Kindergarten

Computer Compatibility: Apple II series

Cost: $49.00 (membership plan available for discount prices; lab packs and network products available)

Purposes: This software consists of four programs designed to teach the association between initial sounds of words and the printed letters. The programs are aimed to introduce young children to phonics (e.g., short vowel sounds in the initial position). This program also helps to develop word recognition and word identification skills.

Modifications: (possible interface options and use with adaptive equipment)

Keyboard (or alternative keyboard)

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	4	0	Easy
On screen instruction	Hard/None	1	2	3	4	0	Easy
Printed Manual/Documents	Hard/None	1	2	3	4	0	Easy
Storing data	Hard/None 0	1	2	3	4	5	Easy
Speed controls	Hard/None 0	1	2	3	4	5	Easy
Instructional Quality	Hard	1	2	3	4	0	Easy

The manual includes a description of each program as well as follow-up suggestions and handouts for coloring and reading. The user can access the program by typing in the letter directly from the keyboard or by choosing it from a "selection box", using the up and down arrow keys. The [esc] key pressed 2x brings user back to menu.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2		4	5	Many
Range of Content	No options	1		3	4	5	Many
Skill Levels	No options	1		3	4	5	Many

There are four different choices on the main menu, but all address the same concepts (e.g., identifying initial sound/letter of a given word). Choices are: Farm; Circus; Magician; Park.

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1	2	3		5	High
Color/Contrast	Low quality	1	2	3	4		High
Clarity	Low quality	1	2	3			High
Animation	Low quality	1	2	3		5	High

All characters and objects are animated. The scenes presented in the first frame of the program build upon themselves, as in an animated story.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options	1		3	4	5	Many
Peer Interaction	No options		2	3	4	5	Many
Individualization	No options	1		3	4	5	Many

At the end of each session, additional drill & practice/review is provided.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1	2		4	5	Many
Visual feedback	No options	1	2	3	4		Many
Printed record	No options	1	2	3	4	5	Many
Scorekeeping	No options		2	3	4	5	Many

The user can turn sound on/off easily. Auditory feedback consists of beeps and computer noises.

Case Example

Software: First Letter Fun

Until recently, Roland, who is six years old, communicated mostly by gestures and guttural sounds. He is now mimicking sounds that are modeled and he is also beginning to use them purposefully (e.g., "Mo" for "more"; "ca ca" for "cracker"). Thus, while he is not at the point where he is learning to identify letters, it is important for him to learn the initial sounds of words, and be able to make a connection between the word and picture.

Roland is paired with another child, who is verbal and can identify words and sounds. The two children work together. Cynthia, his peer-tutor, says the word out loud and Roland attempts to repeat the sound. Cynthia uses this time to practice spelling and penmanship. For example, if the word "apple" is on the screen, she will say it, he will repeat, and she will write it down in a workbook that their teacher made. This activity allows Cynthia to practice writing and spelling, which she needs to do daily according to the educational curriculum, and it gives Roland an opportunity to work in a close situation, modeling language and appropriate behavior, with a peer.

Using the IntelliKeys, which automatically reads the "Arrows Overlay" (with large pictures of the up, down, left, and right arrow keys, and return, spacebar, and escape keys), their teacher set up the program so that the two students are ready to work as soon as they sit down at the computer. When the Selection Box appears on the right hand side of the monitor, with four choices for identifying the initial sound, either the up or down arrow key is pressed to move the cursor and then the return key is pressed to enter the selection. The reason their teacher decided to use the Arrows Overlay with the adapted keyboard, versus using a standard keyboard, is that it enables Roland to independently participate. This also provides Roland with additional opportunities following directions, interacting with peers, and developing language.

FIRST WORDS

Publisher:	Laureate Learning Systems 110 East Spring Street Winooski, VT 05404-1837
Phone:	800-562-6801; 802-655-4755
Target Audience:	Preschool to school age
Computer Compatibility:	Apple IIgs, Apple II series, IBM, and Tandy
Cost:	$225 ($200 for the II series); preview available; replacement policy for 2 years from time of purchase

Purposes: This program is designed to increase language skills, including word recognition and identification, as well as comprehension and symbolic representation. The creature "Blob" is used to teach and reinforce 50 nouns grouped in 10 different categories (e.g., animals; body parts; clothing; common objects; food items; household items; outside things; toys; utensils; vehicles). This program can also be used to address cause-effect, visual memory, and auditory skill development.

Modifications: (possible interface options and use with adaptive equipment)

Switch (with AFC or adapter)	Keyboard (or alternative keyboard)
Joystick	Speech synthesizer (required)
	Touch Window

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	4	0	Easy
On screen instruction	Hard/None	1	2	3	4	0	Easy
Printed Manual/Documents	Hard/None	1	2	3	4	0	Easy
Storing data	Hard/None	1	2	3	4	0	Easy
Speed controls	Hard/None	1	2	3	4	0	Easy
Instructional Quality	Hard	1	2	3	4	0	Easy

Data can be compiled for each student at the end of the activity and a hard copy can be printed. The scan speed and response time can be changed to meet individual needs.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3		5	Many
Range of Content	No options	1		3	4	5	Many
Skill Levels	No options	1		3	4	5	Many

Five levels of instruction are available ranging from very basic (single picture for identification and introductory training) to more complex.

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1	2	3	4		High
Color/Contrast	Low quality	1	2	3	4		High
Clarity	Low quality	1	2	3	4		High
Animation	Low quality	1	2	3	4		High

Graphic images are colorful and the "Blob" character dances and flip-flops on the screen.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options	1	2	3		5	Many
Peer Interaction	No options	1		3	4	5	Many
Individualization	No options	1		3	4	5	Many

Turn-taking can be structured by the teacher.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1	2	3	4		Many
Visual feedback	No options	1	2	3	4		Many
Printed record	No options	1	2	3	4		Many
Scorekeeping	No options	1	2	3	4		Many

Correct answers are reinforced by the animated "Blob" character. After two incorrect responses, the program provides the correct answer.

Case Example

Software: First Words

Harold, who is 8 years old, is learning new words to expand his picture communication vocabulary. Harry communicates with his classmates and teachers by pointing to pictures in a communication book. While he has been identified as having both mild hearing and visual impairments, as well as cognitive impairments, he is able to learn picture representations. During class activities, his teacher is trying to increase opportunities for Harry to socially and appropriately interact with others and use his communication board in a purposeful and meaningful manner.

Harry is paired with another student when he uses the computer. His classmate, who is working on spelling skills, selects the particular program that the two will play (e.g., food items; common objects). The Touch Window is connected and used as the input device. This helps reinforce the notion of pointing to pictures, as Harry currently does when using his communication book. The teacher has printed up a set of pictures that correspond to the nouns in each category (e.g., juice; cookie; milk; book; clock; comb), as well as a set of vocabulary words on separate index cards. The children use these as flash cards, to supplement their learning activity on the computer. The educational goal for Harry is to identify pictures given an auditory cue, while his classmate is responsible for learning the correct spelling of the word. Structured in this fashion, Harry is also able to increase his social turn-taking, proximity, and interaction with peers.

As new picture vocabulary words are acquired, they are added to Harry's communication book. Since many of his classmates have been partners with Harry while using this program, they are familiar with the pictures and comfortable with Harry's use of them as an augmentative communication device.

FUNCTIONAL ACADEMICS

Publisher: Public Domain
(check with various warehouse and resource agencies)

Phone:

Target Audience: Pre-school to Primary Grades

Computer Compatibility: Apple II series

Cost: $ 3 to 5 -- depending upon place of purchase

Purposes: Three major categories in this program (Matching Games; Manipulating Games; & Double Switch Games) address concepts regarding "readiness" skills (e.g., pre-reading and pre-math). Specific skills focus on matching and identifying shapes, colors, numbers, letters, as well as counting and scanning. The user accesses the program via switch input.

Modifications: (possible interface options and use with adaptive equipment)

Switch (with AFC or adapter) Keyboard (or alternative keyboard)

The open-apple key can serve as a switch; 2 switches can be used for some programs.

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	4	0	Easy
On screen instruction	Hard/None	1	2	0	4	5	Easy
Printed Manual/Documents	Hard/None0	1	2	3	4	5	Easy
Storing data	Hard/None0	1	2	3	4	5	Easy
Speed controls	Hard/None	1	2	3	4	0	Easy
Instructional Quality	Hard	1	0	3	4	5	Easy

Options include choosing between direct selection and automatic scanning, as well as setting the speed for user's response time. The [esc] key brings the user back to the menu at any time during the program. There is no printed documentation.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3	4		Many
Range of Content	No options	1	2	3		5	Many
Skill Levels	No options	1	2	3		5	Many

There are 13 different games on disk. The range in content includes simple color and/or shape matching, letter/number identification, counting, and turn-taking.

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1		3	4	5	High
Color/Contrast	Low quality	1	2	3	4		High
Clarity	Low quality	1	2	3	4		High
Animation	Low quality	1		3	4	5	High

Letters can be difficult to see, but those programs with colors and shapes are very vivid.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options	1	2	3	4	5	Many
Peer Interaction	No options	1	2	3		5	Many
Individualization	No options	1		3	4	5	Many

Tic-Tac-Toe & Scanning games involve turn-taking. Parameters can be set by teacher to limit the letters which appear during the ABC game.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options		2	3	4	5	Many
Visual feedback	No options	1	2		4	5	Many
Printed record	No options	1	2	3	4	5	Many
Scorekeeping	No options	1	2	3	4	5	Many

The direct selection mode can be very confusing, since it requires switch hits to move the cursor and then no hit to identify the correct response. The auditory feedback is limited and mostly consists of computer noises and beeps.

Case Example

Software: Functional Academics

Jason is an eight year old boy who has both mild hearing loss and visual impairment. He has difficulty relating to, and interacting with his peers, and is typically interested in activities for only a brief period of time. He communicates by pointing to pictures on a picture communication board and he also uses gestures and a few signs for very basic words. Jason is learning to identify pictures, letters, and some sight words to increase his vocabulary (for his communication board). At school and at home he is also learning to increase his ability to indicate preference.

Jason uses the Functional Academics program for a variety of purposes. The ABC Dragon program is primarily used to increase his letter identification skills, and the Tic-Tac-Toe program (which, for Jason, emphasizes counting and turn-taking skills) is used when he is working with a classmate. Jason is very excited about working on the computer, and it is one of the few activities that holds his interest. Jason can point to keys on the standard keyboard, so his teacher simply modifies the keyboard by placing a bright orange sticker on the open-apple key and a green sticker on the option key (the only keys he needs to use --both of which substitute for switch input).

When using the ABC Dragon program, his teacher sets it for automatic scanning. This way, the cursor moves along the options of 4 letters displayed on the screen, and Jason is required to press the open-apple key when a match appears. He especially likes the dragon's sounds when he identifies a correct match. When using the Tic-Tac-Toe program with a classmate, he requires some assistance from the teacher. His teacher helps him to count the number of spaces he wants to move his "X" or "O", and he then presses the key to correspond to the desired number. For his peers, this is a choice game to be used as a "reward" when they finish other classroom work. Similarly, Jason is given a choice of working on Tic-Tac-Toe when he finishes his other computer work, or a choice of some other activity. His teacher presents him with two picture communication cues and he points to the one he wants. Usually, Jason picks the Tic-Tac-Toe game and then asks a classmate to play with him. This part of his computer work helps to promote Jason's goal of indicating preference.

INTERACTION GAMES

Publisher:	Don Johnston Developmental Equipment POB 639 Wauconda, IL 60084
Phone:	800-999-4660; 312-526-2682
Target Audience:	Early Elementary
Computer Compatibility:	Apple II series
Cost:	$65 (1 year warrenty; user can make 1 backup copy; 7 day inspection period to preview program)

Purposes: This program is designed to teach switch use, promote an understanding of contingency awareness, and increase problem solving, strategy development, as well as social interaction and turn-taking between students. Skill emphasis also includes motor, visual/motor coordination, and attention.

Modifications: (possible interface options and use with adaptive equipment)

Switch (with AFC or adapter)
Speech synthesizer (required)
Keyboard (or alternative keyboard)

[Open-apple/command] and [option] keys can be used to substitute for switches.

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	4	0	Easy
On screen instruction	Hard/None	1	2	3	4	0	Easy
Printed Manual/Documents	Hard/None	1	2	3	4	0	Easy
Storing data	Hard/None	1	2	3	4	5	Easy
Speed controls	Hard/None	1	2	3	4	0	Easy
Instructional Quality	Hard	1	2	3	4	0	Easy

An extensive user manual accompanies the program, and includes information on how to use and program the Adaptive Firmware Card as well as a section on troubleshooting. The user can control the scan speed (1=quick; 9=slow) and make changes through a pop-up window accessed via [ctrl] [W] keys.

Software Subprograms: (variety and range of "subprograms" within menu; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3	4		Many
Range of Content	No options	1	2	3	4		Many
Skill Levels	No options	1	2	3	4		Many

Nine programs on disk include: Zig Zag; Filler Thriller; Race; Bully; Phaserscan; Maze; Beetle Star; Tic-Tac-Toe; & Scantration. An answer key {A} can be used during game. Programs range in content from very basic cause-effect (e.g., Zig Zag) to complex visual memory and scanning (e.g., Scancentration).

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1	2		4	5	High
Color/Contrast	Low quality	1	2	3		5	High
Clarity	Low quality	1	2		4	5	High
Animation	Low quality		--not applicable--				High

Some images may be more difficult to see than others for users with visual impairments (e.g., Scancentration has very small pictures vs. Zig Zag with bright, bold lines).

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program]; student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options	1	2	3	4		Many
Peer Interaction	No options	1	2	3	4		Many
Individualization	No options	1	2	3	4		Many

Programs are structured for either competitive or cooperative activities. User's names are entered for turn-taking (e.g., "Mary's turn.")

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1	2	3	4		Many
Visual feedback	No options	1	2	3		5	Many
Printed record	No options	1	2	3	4	5	Many
Scorekeeping	No options	1	2	3	4	5	Many

Auditory cues are provided throughout program (e.g., "Press your switch"; "Please wait").

Case Example

Software: Interaction Games

Jackson, who is a young teenager, is learning how to use a single switch to access the computer. Eventually, his parents and teachers think Jackson may be able to use some type of electronic augmentative communication device, but he must first learn very basic scanning skills and increase his visual-motor abilities. He currently communicates through gestures and vocalizations (e.g., non-verbal sounds). A classmate of his is also learning to increase visual-motor and turn-taking skills. Other educational goals for both students include counting and basic addition.

Jackson and his classmate, Rena, work together on the computer. They choose between three programs offered from the main menu of the Interaction Games disk. Each student uses a small plate switch, connected to the input/output box of the Adaptive Firmware Card (AFC). Since the main menu is "read" out loud via speech synthesis, the students can select the program they want, and, since the AFC has been already programmed for switch input, they can begin working without any help from the teacher.

Jackson and Rena usually work on the Bully, Phaserscan, and Scancentration programs. Phaserscan is similar to a video-arcade game, which both students enjoy. In addition to addressing visual-motor skills, strategy, and attention skills, the program also requires them to count and add the number of alien spaceships they have shot down. (The winner is the one who shot down the most number of spaceships.) Scancentration is a more difficult game; it is similar to Concentration, but also requires scanning up/down and across the screen. Jackson and Rena take turns trying to make pairs of matching objects. This program requires turn-taking and visual memory, and gives Jackson an opportunity to practice scanning skills in an enjoyable and purposeful manner. The third game they play, Bully, is rather easy for both of them, but they enjoy it and use it at the end of their session on the computer--as a "reward" game for being attentive, taking turns, and working hard on the other programs.

LET'S GO SHOPPING
DISK I: TOYS & GROCERIES

Publisher:	UCLA/LAUSD Microcomputer Project 1000 Veteran Avenue, Room 23-10 Los Angeles, CA 90024
Phone:	310-825-4821
Target Audience:	Elementary School Grades
Computer Compatibility:	Apple II series
Cost:	$35 (back-up disk can be made by the user)

Purposes: This program emphasizes categorization skills. Using grocery items and toys, students are asked to identify (by pressing the switch when the item appears on the screen) which items or objects are found in either a grocery or toy store. This program also addresses scanning skills, since items are flashed on the screen, and a correct answer requires a timed response (switch hit).

Modifications: (possible interface options and use with adaptive equipment)

Switch (with AFC or adapter) Keyboard (or alternative keyboard)
Speech synthesizer (required)

When using the keyboard, keys required are the open-apple key and spacebar.

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	4	0	Easy
On screen instruction	Hard/None	1	2	3	4	0	Easy
Printed Manual/Documents	Hard/None	0	2	3	4	5	Easy
Storing data	Hard/None	1	2	3	4	5	Easy
Speed controls	Hard/None	1	2	3	4	0	Easy
Instructional Quality	Hard	1	2	3	0	5	Easy

Scanning options (e.g., speed) are easy to control. Printed documents come on the disk jacket. [Control-S] turns the sound on and off. [Esc] brings the user back to the menu at any time during the lesson. [Return] freezes the picture currently on the screen.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options		2	3	4	5	Many
Range of Content	No options	1		3	4	5	Many
Skill Levels	No options	1	2		4	5	Many

The user selects between a grocery and toy store.

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality		--not applicable--				High
Color/Contrast	Low quality	1	2	3		5	High
Clarity	Low quality	1	2	3		5	High
Animation	Low quality		--not applicable--				High

Pictures are colorful, although some are very complex.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options		2	3	4	5	Many
Peer Interaction	No options	1	2	3		5	Many
Individualization	No options	1	2		4	5	Many

Number of players (1-4) can be selected and names are entered into program for turn taking. Program runs continually until [esc] is pressed.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1	2		4	5	Many
Visual feedback	No options	1	2		4	5	Many
Printed record	No options	1	2	3	4	5	Many
Scorekeeping	No options	1	2	3	4	5	Many

Auditory feedback sounds very "computerized".

Case Example

Software: Let's Go Shopping

Christina is a 12 year old student who has been identified as having a dual-sensory impairment and cognitive disabilities. Her educational program is currently addressing functional skill acquisition, focusing on communication and daily living skills. She spends part of her day in the school setting and part of her day in the community. In the community she is learning to shop, make change in stores, ask for assistance, and ask for specific items. She communicates through a combination of signs and a small picture communication book.

Christina began using this program with a 5" round switch. Once she developed an understanding of the concept (e.g., press the switch when the item on the screen is one that is found in a grocery store), her teacher faded use of the switch and encouraged her to use the open-apple key. Her teacher helped to identify the open-apple key both visually and tactually by attaching a small, brightly colored piece of felt directly to the keyboard.

Christina uses this software set on the "grocery store" program (since it is more age-appropriate and functional for her than the "toy store" option). Sometimes she uses it by herself and sometimes she works with a partner. In either case, she uses the program prior to her community-based experience. While working on the computer program, her teacher helps her make up a shopping list of items she will need to purchase when she actually goes to the grocery store. Together, they discuss the items that are flashed on the computer screen and write up the shopping list. The "freeze" feature in this program, accessed by pressing the [return] key, allows her teacher to stop the scanning and discuss whether or not Christina may want to purchase a similar item when she goes to the store. Later in the day, Christina and another student use the shopping list in the local grocery store.

THE NEW CAUSE & EFFECT DISK

Publisher: Public Domain
(check with various warehouse and resource agencies)

Phone:

Target Audience: Pre-school to Primary Grades

Computer Compatibility: Apple II series

Cost: $ 3 to 5 -- depending upon place of purchase

Purposes: This program aims to promote understanding of cause-and-effect skills. All activities on the disk can be accessed via switch input. The range of programs addresses basic cause-effect (e.g., "Happy Face") to anticipation, accurate timing, and eye-hand coordination (e.g., "Anti-aircraft" and "Ship").

Modifications: (possible interface options and use with adaptive equipment)

Switch (with AFC or adapter) Keyboard (or alternative keyboard)
Speech synthesizer (required for some programs offered on menu)

Open apple and Option key serve as substitutes for single or double switch input.

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	4	0	Easy
On screen instruction	Hard/None	1	2	0	4	5	Easy
Printed Manual/Documents	Hard/None0	1	2	3	4	5	Easy
Storing data	Hard/None0	1	2	3	4	5	Easy
Speed controls	Hard/None	1	2	0	4	5	Easy
Instructional Quality	Hard	1	2	3	4	0	Easy

[Esc] brings user back to menu at any time during the program. The speed can be controlled in some of the programs (e.g., Anti-aircraft).

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3	4		Many
Range of Content	No options	1	2	3		5	Many
Skill Levels	No options	1	2	3		5	Many

12 programs are on disk, ranging from very simple cause-effect to more complex skills. Some programs are geared for young children (e.g., Happy Face; Music & Boxes), yet others (Anti-aircraft; Ship) are presented similarly to older student s video arcade games.

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality		--not applicable--				High
Color/Contrast	Low quality	1	2	3	4		High
Clarity	Low quality	1	2	3	4		High
Animation	Low quality	1	2		4	5	High

Music & Boxes and Happy Face have very clear and bright images.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options		2	3	4	5	Many
Peer Interaction	No options	1		3	4	5	Many
Individualization	No options	1		3	4	5	Many

For some games, user can control whether program activates when switch is depressed or released and can program in student's name. Turn taking must be structured by teacher.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1	2	3		5	Many
Visual feedback	No options	1	2	3		5	Many
Printed record	No options		2	3	4	5	Many
Scorekeeping	No options		2	3	4	5	Many

Some programs will print data (e.g., speed). Familiar preschool songs are used for Music & Boxes and Happy Face programs.

Case Example

Software: The New Cause & Effect Disk

Nat is a four year old preschooler who communicates mostly through gestures and vocalizations. Nat is blind, but has some light perception. He also has a mild hearing impairment (yet, when the volume is turned up, he can hear music and seems to enjoy it very much). He is learning to make requests and indicate basic wants and needs. Other educational goals include: increasing his understanding of cause-effect relationships (e.g., to promote his ability to independently control objects in his environment); and, learning to differentiate various textures and objects in his environment.

Nat mostly uses the Happy Face, Music & Boxes, and Funny Noises programs on this disk. Since he enjoys music and is familiar with preschool songs, the auditory feedback that these three programs provide is very reinforcing and motivating. The volume on the Echo Speech Synthesizer is turned up so that Nat can easily hear the music and noises, and the classroom lights are dimmed to enhance the contrast of images on the computer monitor. Nat began with the Happy Face and Funny Noises programs, for which he used a single switch. The switch was set to activate the program when pressed. When he was first exposed to the 5" round switch, Nat continually banged on it. However, he now understands that he only needs to gently press the switch to make the music come on.

After learning single switch access, Nat began using an adapted keyboard. For the Music & Boxes program his teacher made an adapted overlay for the Unicorn IntelliKeys Keyboard. The overlay is divided into two halves and each half is covered with a different texture. The left half, which emulates the open apple key on the standard keyboard, is covered with colorful felt cloth. When he presses this side, the Music & Boxes program runs with colorful images and songs. The right side has thin lines of sandpaper, and when pressed, nothing happens. Nat is learning that the left side represents "more" and the right side represents "finished". After he presses the left side one time and the music and images come on, his teacher asks him if he wants more, and helps him form the sign for "more". He then is given the keyboard, and presses the soft felt side for more music. Nat enjoys this very much, and has begun to spontaneously sign for "more".

His teacher sometimes pairs Nat with a classmate, and the two students take turns by passing the switch or keyboard back and forth. They are learning to initiate signs and make requests such as "my turn".

ONCE UPON A TIME (VOLUME II)
WORLDS OF ENCHANTMENT

Publisher:	Compu-Teach 16541 Redmond Way, Suite 137 C Redmond, WA 98052-4482
Phone:	800-44-Teach; 206-885-0517
Target Audience:	Elementary and Middle School
Computer Compatibility:	Apple II series
Cost:	$ 59.95 (30 day preview policy; replacement policy if disk is damaged; backup disks made by user; Lab Pack and Teacher Edition available)

Purposes: This program is designed to promote the acquisition of reading skills, focusing on areas of vocabulary, writing and composition, spelling, and, comprehension. Graphics (controlled via key strokes on the keyboard) can be used to create specific scenes and are incorporated into individualized story writing activities. Other cognitive skills addressed include concepts of spatial relationships (e.g., up/down; left/right) and design activities.

Modifications: (possible interface options and use with adaptive equipment)

Keyboard (or alternative keyboard)

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	0	5	Easy
On screen instruction	Hard/None	1	2	3	4	0	Easy
Printed Manual/Documents	Hard/None	1	2	3	0	5	Easy
Storing data	Hard/None	1	2	3	4	0	Easy
Speed controls	Hard/None0	1	2	3	4	5	Easy
Instructional Quality	Hard	1	2	3	4	0	Easy

A single "page" or entire story can be stored to disk and/or printed. The program uses the four arrow keys to move the picture around on screen. Set up requires changing disks (side A to side B). The program comes with a pack of colored pencils for students to use after their stories are printed.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3	4		Many
Range of Content	No options	1	2	3	4		Many
Skill Levels	No options	1	2	3	4		Many

Skills range from choosing and moving a picture image, to writing and editing a storybook.

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1	2		4	5	High
Color/Contrast	Low quality	1	2	3	4		High
Clarity	Low quality	1	2		4	5	High
Animation	Low quality		2	3	4	5	High

A wide range of illustrations are available to the user. Most graphics are visually complex. Font on screen and some images may be difficult for users with visual impairments.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options	1	2	3	4		Many
Peer Interaction	No options		2	3	4	5	Many
Individualization	No options	1	2	3	4		Many

Students can work together in partners or small groups to create stories, as structured by teacher. Activities can be geared to meet various goals (e.g., from learning concepts such as up/down to reading and writing skills).

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options		2	3	4	5	Many
Visual feedback	No options	1	2	3		5	Many
Printed record	No options	1	2	3	4		Many
Scorekeeping	No options		--not applicable--				Many

Minimal auditory feedback is available (e.g., computer beeps). Stories and illustrations can be printed, stored to disk, and edited.

Case Example

Software: Once Upon a Time: World of Enchantment

Amanda is a twelve year old student in a combination 5th-6th grade classroom. She has physical disabilities as well as limited vision yet can see large images given sharp contrast; her hearing is questionable. Amanda uses a combination of verbal speech and some sign language to communicate expressively. However, she is very shy and does not like to talk to unfamiliar people, including peers, because they may have difficulty understanding her speech. As a result, she does not typically participate in large group activities and often feels isolated.

Amanda's teacher has begun using cooperative learning strategies as a way of grouping students (e.g., to promote interaction and interdependence). For "creative writing" class, Amanda is paired with three other students, all of whom are developing writing skills. While Amanda is not learning the same writing skills as her peers, she nevertheless needs to spend time with others to increase her expressive and receptive language and to increase interaction skills. Some of her other IEP goals include learning to follow basic directions (e.g., right; left; up; down) and increase vocabulary.

To address these IEP goals and to simultaneously meet the educational needs of the other students in her group, their teacher decided to use this program with an adapted keyboard. Amenda's role during the group activity is to help decide which characters and objects the students will include in their story, to select them from the list on the menu, and to move the images around on the "page". To accomplish this, her teacher constructed an overlay for the Unicorn Expanded Keyboard which includes the four arrow keys, the [return] key, and the [esc] key. The arrows are approximately four inches long and colored in black (to enhance contrast on the white paper). Amanda is able to use this adapted keyboard while one or two of her peers use the standard keyboard to type in the story. Together with her group members, they decide to move the images up, down, left, or right, and Amanda presses each arrow key accordingly. New vocabulary words are introduced throughout the development of the story, and since she is involved in helping to create the story, she is learning to make sentences with new vocabulary words. Most importantly, with this program and adapted equipment, Amanda is interacting with her classmates as an integral member of their small group.

PODD

Publisher:	Sunburst Communications 101 Castleton Street Pleasantville, NY 10570-3498
Phone:	800-628-8897; 914-747-3310
Target Audience:	Kindergarten to 3rd grade
Computer Compatibility:	Apple II series; IBM: Tandy 100
Cost:	$65 (30 day preview policy; free lifetime replacement warranty; includes backup disk; lab pack available)

Purposes: This program is designed to teach action verbs (approximately 115 verbs) through the use of an animated character named Podd. The student is prompted to enter a verb which is then animated on screen. The program has two levels. Cognitive concepts can be adapted to range from promoting cause-effect skills to sight word recognition and vocabulary development.

Modifications: (possible interface options and use with adaptive equipment)

Keyboard (or alternative keyboard)
Switch (for scanning with AFC or adapter)
Speech synthesizer (required)

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	0	5	Easy
On screen instruction	Hard/None	1	2	3	4	0	Easy
Printed Manual/Documents	Hard/None	1	2	3	4	0	Easy
Storing data	Hard/None 0	1	2	3	4	5	Easy
Speed controls	Hard/None 0	1	2	3	4	5	Easy
Instructional Quality	Hard	1	2	3	0	5	Easy

There are no speed controls or data storing capabilities. The manual includes a variety of supplemental activities. Set up options include choosing one of two levels.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1		3	4	5	Many
Range of Content	No options	1	2		4	5	Many
Skill Levels	No options	1		3	4	5	Many

Two subprograms include choosing one action for Podd or many for him to perform in sequence. Verbs range from simple (e.g., walk) to complex synonyms (e.g., saunter).

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1	2	3	4		High
Color/Contrast	Low quality	1	2	3	4		High
Clarity	Low quality	1	2	3	4		High
Animation	Low quality	1	2	3		5	High

'Words are presented in clear large print. Podd appears on a black background as he animates the actions.

Student Options: (choices/availability of interactive studeat programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options	1	2		4	5	Many
Peer Interaction	No options	1	2		4	5	Many
Individualization	No options		2	3	4	5	Many

Turn-taking activities can be structured by the teacher. The student controls Podd's actions by entering new words.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1		3	4	5	Many
Visual feedback	No options	1	2	3	4		Many
Printed record	No options	1	2	3	4	5	Many
Scorekeeping	No options	1	2	3	4	5	Many

Podd animates a correctly entered verb; incorrect entries are automatically cleared and the student is told Podd cannot perform the action. There is no printing or scorekeeping.

Case Example

Software: Podd

Jane is a 10 year old student who is deaf-blind and has cognitive delays. She has a moderate hearing loss and is considered legally blind. Her communication system includes a limited sign language vocabulary, object cues combined with some pictures to represent activities during her day, and photographs of familiar people. Jane's educational goals prioritize increasing her communication skills.

Before Jane began using this program, her teacher constructed an overlay for the Unicorn Expanded Keyboard. The overlay contained four black and white drawings of Podd performing the actions "run", "walk", "dance", and "jump". She divided the overlay into eight equal squares, placing a picture in every other square (e.g., staggering the pictures). Through the Adaptive Firmware Card (AFC), her teacher also added speech feedback to each square/key so that when a specific key is pressed, a sentence will be spoken back to Jane. For example, when the square "run" is pressed, the Echo speech synthesizer speaks "Podd can run", and the software program simultaneously animates the picture.

When Jane uses the program, her teacher places the Unicorn Keyboard directly in front of the monitor, plugs it into the AFC, and selects the appropriate overlay from the AFC's Quick-Start menu. The teacher loads the program and selects "See What Podd Can Do". Jane is prompted to press one of the four pictures on the keyboard. The teacher also signs the specific word and follows through with a physical action (e.g., if the word is "run", Jane and a classmate run back and forth across the room one time). This adaptation provides Jane with an opportunity to experience the meaning of language and helps her to make the connection between the use of pictures and functional actions.

In a group activity, this overlay and similar ones can be used to play games such as Simon Says (e.g., Jane can take the role of "Simon" and the rest of her classmates are players and vice versa). By combining words with pictures, students with varied abilities can use the program together, each at their own level.

STICKYBEAR ABC

Publisher:	Weakly Reader Software Optimum Resource, Inc. 10 Station Place Norfolk, CT 06058
Phone:	800-327-1473; 203-542-5553
Target Audience:	Preschool and Primary Grades
Computer Compatibility:	Apple II series; Laser 128; compatibles
Cost:	$39.99 (can exchange a 5.25 disk for a 3.5 disk; back-up disk available for $10; limited warranty)

Purposes: The general aim of this program is to teach and review letters of the alphabet. The program is appropriate for teaching pre-reading activities (e.g., letter identification, letter-picture association, etc.) yet can also be used for simple cause-effect (e.g., since pressing any key results in a new picture and sound on the computer).

Modifications: (possible interface options and use with adaptive equipment)

Keyboard (or alternative keyboard) Switch (with AFC)

For switch input, the scanning array must be set on the Adaptive Firmware Card (set to inverse scanning on the fastest speed). Pressing the switch activates the scanning array and releasing it randomly selects a letter.

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	4	0	Easy
On screen instruction	Hard/None	1	2	3	4	0	Easy
Printed Manual/Documents	Hard/None	1	2	3	0	5	Easy
Storing data	Hard/None0	1	2	3	4	5	Easy
Speed controls	Hard/None0	1	2	3	4	5	Easy
Instructional Quality	Hard	1	2	3	0	5	Easy

Set up for this program is quick and easy. The program comes with a Stickybear poster and User's Guide. The program uses only letter keys (e.g., no number, control, or arrow keys). This is a very good program for teaching basic letter identification.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3	4	5	Many
Range of Content	No options		2	3	4	5	Many
Skill Levels	No options	1		3	4	5	Many

Instuctional levels can be structured to meet student needs (e.g., cause-effect to matching letters). There are two pictures per letter (e.g., "B"= bee and ball).

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1	2	3	4		High
Color/Contrast	Low quality	1	2	3	4		High
Clarity	Low quality	1	2	3	4		High
Animation	Low quality	1	2	3	4		High

All components of the graphic design and animation are clear and very well presented.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options	1		3	4	5	Many
Peer Interaction	No options		2	3	4	5	Many
Individualization	No options		2	3	4	5	Many

The user can pick any letter to get a picture on screen. Peer interaction must be structured.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1		3	4	5	Many
Visual feedback	No options	1	2	3	4		Many
Printed record	No options	1	2	3	4	5	Many
Scorekeeping	No options	1	2	3	4	5	Many

Auditory feedback consists of beeps and computer noises.

Case Example

Software: Stickybear ABC

Sarina, who is in the first grade, is learning to match letters and pictures. Since Sarina has a visual impairment, she requires very vivid images to "catch" and sustain her visual attention. An auditory component is not necessary for her, due to her profound hearing loss. Sarina is also learning American Sign Language to increase her expressive and receptive communication.

When using this program, her teacher dims the overhead room lights to maximize the contrast of images on the computer monitor. An adapted overlay was constructed for the Unicorn Expanded Keyboard, with large dark letters of the alphabet on a light background. Each letter has a piece of velcro next to it and the overlay is placed on top of the Unicorn Keyboard and held in place with plastic tape. Using the Adaptive Firmware Card, the Unicorn was programmed for 8 square keys. The teacher added sound so that when Sarina uses the program with her classmates, auditory feedback is available on the Echo Speech Synthesizer. Each square was programmed to represent a specific letter and the speech synthesizer "speaks" the letter when the key is touched. Large cards were constructed with pictures copied from the Stickybear Poster. The pictures were colored to match the images as presented on the screen and the cards cut to the same size as the Unicorn squares with velcro placed on the back.

Since Sarina is just beginning to learn letters, her teacher choose letters A-H for the first overlay. Sarina is also learning new signs and the manual alphabet, so when a letter is pressed and she sees it on the screen, she imitates the signed letter and/or picture, given a prompt from her teacher . She locates the card with the picture and places it on the overlay, matching it to the letter on screen. When the overlay is filled with pictures, the teacher removes it and replaces it with another overlay. During computer time, Sarina chooses a classmate to be her partner, which allows her classmates to also learn some of Sarina's new signs. Thus, even though her classmates already know their "ABC's", they can learn the manual alphabet and several signs during these purposeful interactions.

STICKYBEAR OPPOSITES

Publisher:	Weakly Reader Software Optimum Resource, Inc. 10 Station Place Norfolk, CT 06058
Phone:	800-327-1473; 203-542-5553
Target Audience:	Preschool and Primary Grades
Computer Compatibility:	Apple II series; Laser 128; compatibles
Cost:	$39.99 (can exchange a 5.25 disk for a 3.5 disk; back-up disk available for $10; limited warranty)

Purposes: Cognitive concepts addressed within this program range from simple cause-and-effect (e.g., press any key to make a change on the monitor) to language development (including concepts of matching; differentiating; and identifying opposites).

Modifications: (possible interface options and use with adaptive equipment)

Keyboard (or alternative keyboard)	Speech synthesizer (required)
Joystick	Switch (with AFC)

If using keyboard, program works with either the arrow keys or the number 1 & 2 keys. There is a setup on the Adaptive Firmware Card which will allow this program to be used with a switch.

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	4	0	Easy
On screen instruction	Hard/None	1	2	3	4	0	Easy
Printed Manual/Documents	Hard/None	1	2	0	4	5	Easy
Storing data	Hard/None0	1	2	3	4	5	Easy
Speed controls	Hard/None0	1	2	3	4	5	Easy
Instructional Quality	Hard	1	2	3	4	0	Easy

A children's book of opposites and poster, as well as a parent's guide, accompany the software program.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3	4	5	Many
Range of Content	No options	1		3	4	5	Many
Skill Levels	No options	1		3	4	5	Many

The Stickybear book & poster can be used to reinforce concepts and language activities.

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1	2	3	4		High
Color/Contrast	Low quality	1	2	3	4		High
Clarity	Low quality	1	2	3	4		High
Animation	Low quality	1	2	3	4		High

Animation is very high quality and pictures are colorful.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options		2	3	4	5	Many
Peer Interaction	No options	1		3	4	5	Many
Individualization	No options	1	2		4	5	Many

Structured activities and suggestions for turn-taking are available in the parent's guide.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1	2	3	4		Many
Visual feedback	No options	1	2	3	4		Many
Printed record	No options	1	2	3	4	5	Many
Scorekeeping	No options	1	2	3	4	5	Many

Auditory and visual cues are clear and highly motivating.

Case Example

Software: Stickybear Opposites

Ricky is a 6 year old boy who is in a half-day kindergarten program. He is very friendly and enjoys the company of his classmates. Ricky has severe physical impairments and as well as hearing, vision, and cognitive disabilities. Ricky communicates with his classmates through a combination of nonverbal gestures (e.g., pointing) and verbal language, yet it is difficult for an unfamiliar listener to understand his words. His parents, teachers, and speech therapist have been emphasizing the development of Ricky's expressive communication and ability to initiate interactions with his peers.

At school, Ricky's classmates are learning "pre-reading" skills, including matching, letter identification, as well as concepts such as in/under; in front/behind;etc. Some of Ricky's goals are to initiate interaction, participate in turn-taking, and engage a peer in brief conversation, as well as to increase his vocabulary and ability to be understood by others. The Stickybear Opposites program enables Ricky to work with a classmate, while both he and his classmate address their individual educational goals.

Since Ricky has a limited range of motion in his arms, he uses the Unicorn Expanded Keyboard to access the computer. The "keys" on the adaptive keyboard have been programmed with large target areas, in the lower left portion of the keyboard. They are grouped next to each other to minimize the need to reach far up or over. The overlay has big drawings of the arrow keys, and is very colorful and easy to visually recognize. His teacher programmed the Unicorn Expanded Keyboard to have two large areas representing the two arrow keys and a third area for the spacebar. During computer time, Ricky chooses his partner by asking if the boy or girl would like to play on the computer with him (one of his goals). Both students sit next to each other and both use the Unicorn keyboard, which is on Ricky's wheelchair lap tray. The booklet that accompanies the Stickybear program is used simultaneously while the students are working on the computer. For example, as Ricky presses the arrow keys or spacebar, his peer looks for the new picture in the booklet, which helps to reinforce concepts of matching and discrimination.

TEENAGE SWITCH PROGRESSIONS

Publisher:	R.J. Cooper & Associates 24843 Del Prado, Suite 283 Dana Point, CA 92629
Phone:	714-240-1912
Target Audience:	Middle School (Adolescents)
Computer Compatibility:	Apple II series
Cost:	$75 (this is a shareware program -- the user has 10 free trails before deciding to purchase)

Purposes: This program is designed to teach and reinforce the acquisition of cause-effect skills. The program utilizes age-appropriate concepts (e.g., preparing a meal), geared for teenagers with severe cognitive and/or physical disabilities. It teaches use of a single-switch and can be used to promote vocabulary or language development, as well.

Modifications: (possible interface options and use with adaptive equipment)

Switch (with AFC or adapter)	Keyboard (or alternative keyboard)
Touch Window	Speech synthesizer (required)

The open-apple key can substitute for a switch.

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	4	0	Easy
On screen instruction	Hard/None	1	2	3	0	5	Easy
Printed Manual/Documents	Hard/None	1	2	0	4	5	Easy
Storing data	Hard/None0	1	2	3	4	5	Easy
Speed controls	Hard/None	1	2	3	4	0	Easy
Instructional Quality	Hard	1	2	3	0	5	Easy

The user or teacher can control speed by typing in a number 1-9; the [esc] key brings the user back to the menu at any time during the session. The program automatically adjusts between the Touch Window or single switch.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3	4		Many
Range of Content	No options	1	2		4	5	Many
Skill Levels	No options	1	2		4	5	Many

Skill levels address cause/effect (level 0); attending/waiting (level 1); following verbal directions (level 2); and, responding to timed screen prompts (levels 3 & 4).

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1	2		4	5	High
Color/Contrast	Low quality	1	2	3	4		High
Clarity	Low quality	1	2	3		5	High
Animation	Low quality	1	2	3		5	High

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options	1	2	3		5	Many
Peer Interaction	No options	1		3	4	5	Many
Individualization	No options	1	2		4	5	Many

Student interaction can be structured by the teacher (e.g., turn-taking).

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1	2		4	5	Many
Visual feedback	No options	1	2	3	4		Many
Printed record	No options	1	2	3	4	5	Many
Scorekeeping	No options	1	2	3	4	5	Many

Controlling sound is very easy; auditory feedback consists mostly of noises and beeps.

Case Example

Software: Teenage Switch Progressions

Anna is a 13 year old student who is very friendly and inquisitive. She enjoys interacting with her peers. Anna has visual impairments as well as a mild hearing loss and cognitive impairments. Many of her educational goals address activities of daily living and functional skill development. She is learning the different steps in several specific activities (e.g., preparing a snack) and is learning to sequence things in order (first, second, third). She communicates through spoken language, although her expressive vocabulary is limited. She imitates spoken words, and uses this to increase her own vocabulary.

Anna uses the Touch Window with this program. The Touch Window helps her to focus on the screen (e.g., so that she does not need to look down for the switch and then back up to the monitor). While she works on this computer program, she is assisted by a teacher aide. Before Anna presses the Touch Window to progress to the next scene, the aide engages her in conversation and asks her to verbally identify what the girl on the screen needs to do next. Then Anna presses the Touch Window and the activity is carried out to the following step. In this manner, not only is Anna learning the sequence of activities, but she is also learning the specific vocabulary words involved in these situations.

Anna uses two of the subprograms within this software program ("Eating" and "Popcorn"). These two programs address the sequence of activities involved in: (1) making popcorn; and (2) in identifying what objects are required to eat a snack at the table (e.g., picking up a plate; bringing it over to the table; setting the table; etc.). These two programs work well for Anna because during computer class she can work on this software, and then during the next class on her schedule, she participates in doing the actual activity (e.g, making popcorn during snacktime). Since she has just come from the computer session focusing on these same concepts and using the same vocabulary, Anna is able to more readily participate in these real activities with her classmates, requiring very little assistance from the teacher.

TOUCH N' WRITE

Publisher:	Sunburst Communications 101 Castleton Street Pleasantville, NY 10570-3498
Phone:	800-628-8897; 914-747-3310
Target Audience:	Kindergarten to 2nd Grade
Computer Compatibility:	Apple II series
Cost:	$75 (30 day preview policy; back-up disk included; free lifetime warranty; lab pack & network version available)

Purposes: This program is designed to teach standard manuscript handwriting. There are 21 lessons in all, and the student traces letters on the screen using the Touch Window. The student receives prompting and visual feedback as each letter is traced. Each new lesson builds on the previous one. Other target areas include visual motor skills and visual memory.

Modifications: (possible interface options and use with adaptive equipment)

Touch Window

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	0	5	Easy
On screen instruction	Hard/None	1	2	3	0	5	Easy
Printed Manual/Documents	Hard/None	1	2	3	4	0	Easy
Storing data	Hard/None	1	2	3	4	0	Easy
Speed controls	Hard/None 0	1	2	3	4	5	Easy
Instructional Quality	Hard	1	2	3	4	0	Easy

Set up options involve entering the student's name (to recall previous position within program). Records are kept on disk; the manual provides clear instructions and additional activities.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3	4	5	Many
Range of Content	No options	1	2	3		5	Many
Skill Levels	No options	1	2	3		5	Many

Choice of levels include: strokes, upper or lower case letters, numbers, & practice mode.

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality	1	2	3	4		High
Color/Contrast	Low quality	1	2	3	4		High
Clarity	Low quality	1	2	3	4		High
Animation	Low quality	1	2	3	4		High

Letters are clear and large, presented on a black background. Each letter fills with color as it is traced and then slides off the screen.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options	1	2	3	4	5	Many
Peer Interaction	No options	1	2	3	4	5	Many
Individualization	No options	1	2	3	4		Many

This program is not geared for group or turn taking activities. Teacher menu allows extensive individualization as well as creation of new lessons with specific vocabulary.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1		3	4	5	Many
Visual feedback	No options	1	2	3	4		Many
Printed record	No options	1		3	4	5	Many
Scorekeeping	No options	1	2	3	4		Many

Program gives student a printed copy (reinforcer) at the end of each lesson, in the form of a practice sheet.

Case Example

Software: Touch n' Write

Robin is a 7 year old girl who is deaf-blind and has mild cerebral palsy. She communicates through sign language, gestures, and pointing to line drawings on a communication board. Her educational program has a strong focus on language and communication development. Robin is beginning to work in academic areas which address number concepts, letter identification, and early reading and writing skills. She is starting to trace the letters of her name with black markers on paper.

When Robin uses the Touch n' Write program, her teacher sets up the Touch Window and moves the monitor to a separate stand on the desk, so that it is at eye level with Robin and within easy reach. Since Robin will be using the Touch Window instead of the keyboard, the keyboard is moved away.

While using the program, a single letter is displayed on the screen. Robin is directed to watch as the animated hand traces the letter, coloring it orange in the process. Robin then traces the letter herself. As each new letter appears, Robin's teacher shows her a printed flash card with the matching letter. Her teacher sometimes gives her two or three cards to choose from, to finding the matching letter (e.g., to reinforce skills such as matching, discrimination, and letter identification). After Robin traces the letter on the Touch Window, she also traces it on paper using a black marker. This helps to transfer the skills learned during the computer activity to other situations. At the end of the computer lesson, Robin receives a printed copy of the letters she traced.

This program provides Robin with valuable exercises in visual-motor skills. Not only is she learning to print her name, but she has become more attentive to other people's hand movements as they sign to her. She watches carefully and tries to imitate signs. Robin's teacher is beginning to present the fingerspelled letter simultaneously with the written letter when Robin is working on this program. This enables her teacher to address and reinforce many different concepts all during the same computer-based activity.

THIS IS THE WAY WE WASH OUR FACE

Publisher:	UCLA/LAUSD Microcomputer Project c/o UCLA Intervention Program Room 23-10 1000 Veteran Avenue Los Angeles, CA 90024
Phone:	213-825-4821
Target Audience:	Early Intervention/Preschool (18 months-to-3 years)
Computer Compatibility:	Apple II series
Cost:	$25 (field test copy available)

Purposes: This program teaches cause-and-effect through the use of a familiar preschool song. Different verses are represented on a picture overlay for the PowerPad. Through the use of the Echo speech synthesizer and animation on screen, the student can see and hear each verse of the song.

Modifications: (possible interface options and use with adaptive equipment)

PowerPad
Speech synthesizer (required)

"User-Friendly Features": (teacher access for set-up & implementation; adaptations that can be made for the student; rate 1-5 with 0)

Set up	Hard	1	2	3	0	5	Easy
On screen instruction	Hard/None	1	2	3	4	0	Easy
Printed Manual/Documents	Hard/None0	1	2	3	4	5	Easy
Storing data	Hard/None0	1	2	3	4	5	Easy
Speed controls	Hard/None0	1	2	3	4	5	Easy
Instructional Quality	Hard	1	2	3	0	5	Easy

The program is very simple to operate and easy to set up. Printed material is not available.

Software Subprograms: (variety and range of "subprograms" within menu'; number of instructional levels to accommodate varying skill levels; rate 1-5 with)

Subprograms	No options	1	2	3	4	5	Many
Range of Content	No options	1		3	4	5	Many
Skill Levels	No options		2	3	4	5	Many

The program allows students to work on cause-effect and vocabulary by choosing one of five pictures on the keyboard.

Graphic Design: (overall graphic presentation; rate 1-5 with)

Print/Font	Low quality		--not applicable--				High
Color/Contrast	Low quality	1	2	3		5	High
Clarity	Low quality	1	2	3		5	High
Animation	Low quality	1		3	4	5	High

Large simple graphics are animated to correspond to various verses of the song.

Student Options: (choices/availability of interactive student programming [e.g., deciding what comes next in program];student interaction; individualizing [e.g., choosing number of trials]; rate with)

Interactive Programming	No options	1	2		4	5	Many
Peer Interaction	No options	1	2		4	5	Many
Individualization	No options	1	2	3	4	5	Many

While there are no real options for individualizing the program, students can choose which verse will be played by pressing the picture on the PowerPad. The teacher can structure turn-taking or group activities.

Reinforcers/Feedback: (amount of motivational feedback; recordkeeping; rate with)

Auditory feedback	No options	1	2		4	5	Many
Visual feedback	No options	1	2		4	5	Many
Printed record	No options	1	2	3	4	5	Many
Scorekeeping	No options	1	2	3	4	5	Many

The Echo speech synthesizer sings each verse clearly, and accompanies the animation on the screen. This program is good for students with mild to moderate hearing loss.

Case Example

Software: This is the Way We Wash Our Face

Kevin is a five year old boy who communicates his needs through gestures and behaviors. Kevin is totally blind and has a mild to moderate hearing loss, yet he receptively is able to understand a combination of both speech and sign language. His educational goals focus on increasing expressive communication skills.

Kevin enjoys music and is learning to label objects. Although Kevin does not see the computer screen, he can use this software program with modifications on the Power Pad overlay. His teacher made a photocopy of the original overlay that accompanies the program (rather than using the original, the photocopy allows the teacher to have more than one type of overlay available). The modification for Kevin contains regular size objects attached with velcro to the overlay. The objects, such as a comb and toothbrush, represent the various verses of the song "This is the way we wash our face". The overlay is placed on the Power Pad and used exactly as it would be without the object cues (e.g., as a regular Power Pad is used). The regular keyboard is moved to the side, since Kevin does not need to use it, and the Power Pad is placed directly in front of him for easy access. The Echo speech synthesizer is place on top of the monitor with the volume turned up slightly.

Kevin is encouraged to explore the keyboard and feel each of the objects. He can find the toothbrush and pull it, removing it from the keyboard. As he does, the pressure of his hand activates the area of the Power Pad representing that verse of the song. The song is heard through the Echo, and while the singing occurs his teacher guides him in the hand movements of the song (e.g., moving the toothbrush across his mouth). This activity helps Kevin to begin to develop symbolic representations, and reinforces one educational goal of learning to label and identify objects.

Technological Resources for Students with Deaf-Blindness and Severe Disabilities

Resource Lists

Resource Lists

The section that follows provides specific information on a range of resource materials. This is designed to provide general reference information. This section is divided into nine parts.

Part 1 begins with information regarding peripheral equipment and adaptive devices. Arranged by the company that produces or markets the item, many different types of adaptive devices are described. Part 2 includes descriptions of commercially available software, also arranged by company or publisher. Public Domain software, Part 3, is listed by program and followed by a list of resources (Part 4) where such programs can be obtained. Part 5 is a list of mailorder warehouses which may provide discounted software or materials. Technology Resources, Part 6, include referral or resource agencies. Parts 7 and 8 provide information regarding publications and electronic bulletin boards, useful for learning state-of-the-art developments and applications.

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PERIPHERAL EQUIPMENT and ADAPTIVE DEVICES

ABLENET/AccessAbility, Inc.
360 HOOVER STREET, N.E.
MINNEAPOLIS, MN 55413
800-322-0956

•**Control Unit**--The Control Unit allows two standard electrical devices to be operated via switch, without specific adaptation. Devices (e.g., radio, popcorn-maker, small t.v.) are plugged into the Control Unit, which is then plugged into an outlet; switches are also plugged into the Control Unit, and can turn the devices on and off. A timer allows the device to be operated for a specific amount of time (2 to 90 seconds) per switch hit.
[Cost is $130.00]

•**Universal Switch Mounting System**-- This allows switches to be mounted in various positions depending upon the individual's needs (e.g., on the arm of a wheelchair, desktop, laptray, etc.).
[Cost is $185.00]

•**Battery Device Adapter**--This tool quickly adapts AA, C and D size battery-operated toys and objects so that they may be used with switches.
[Cost is $7.00]

•**Switch Latch Interface**--Allows a momentary switch to be operated as an on/off switch.
[Cost is $47.00]

•**"Big Red" or "Jelly Bean" Switches**--Big Red (5") and Jelly Bean (2.5") are round push switches with click feedback.
[Cost is $39.00 per switch]

BERKELEY SYSTEMS, INC.
2095 ROSE STREET
BERKELEY, CA 94709
510-540-5535

•**inLARGE**--inLARGE is a screen magnification utility program which works with all Macintosh systems. It is accessed through the Control Panel.
[Version 2.0 released July 92. Cost is $195.00]

•**outSPOKEN**--This is a screen reading program designed for the Macintosh. Through the numeric keypad on the standard keyboard, the user can have total control of computer functions, including word processing.
[Version 1.7 is close to release. Cost will be announced]

DON JOHNSTON DEVELOPMENTAL EQUIPMENT
P.O. BOX 639
1000 N. RAND RD., BLDG. 115
WAUCONDA, ILLINOIS 60084
800-999-4660

•**Adaptive Firmware Card**--The AFC is a keyboard emulator that controls the computer for various input methods (e.g., an alternate keyboard such as the Unicorn Expanded or TASH King; a switch or several switches; morse code; and/or dedicated communication aids). Enables scanning, speech feedback, and other adaptation of commercial software.
[Cost is $520.00]

•**Ke:nx**--Emulation device for the Macintosh computer that allows for alternative access through switches, adaptive or alternative keyboards, scanning, morse code. Use to add speech, change speed, add delay, etc.
[Cost is $780.00]

•**Switches**--A variety of switches are available that include: a Plate Switch with click feedback; L.T. Switch for very light touch.
[Plate and L.T. Switches cost $46.00]

DUNAMIS, INC.
3620 HIGHWAY 317
SUNWANEE, GA. 30174
800-828-2443

•**PowerPad**--The PowerPad, an alternative input device for the computer for either the Apple or IBM, is a re-programmable touch-sensitive tablet. The 12"x12" board uses overlays that can be individually developed for specific software or for a talking communication board. The "Starter Kit" includes the PowerPad, the PowerPort (cable and external I/O pin port which attaches to the side of the computer and allows for easy connection of the PowerPad), and one software program. The Tool Kit Software allows users to display graphics and control text printed on the screen, as well as to divide the pad from 1 up to 120 individual keys. Can be used with the Echo.
[PowerPad Starter Kit is $249.95 for the Apple and $279.95 for the IBM; PowerPad cost is $199.95; the Apple PowerPort is 39.95 (the IBM requires cables for $24.95 in place of the PowerPort); and the Tool Kit software is $99.95]

EDMARK CORPORATION
P.O. BOS 3903
BELLEVUE, WA 98009
800-426-0856

•**Touch Window**--The Touch Window, attached to the computer's monitor, is an alternative input device which operates via pointing or touching the screen. The transparent screen, attached with velcro, can be removed and used on a lap tray or desktop. It can be used with a variety of specific educational software, for scanning and direct selection, and as a graphics tablet. It comes with the Master Touch Diskette which contains five programs. The Apple Touch Window can be used with the Macintosh LC computer, to access Apple software, only if an Apple IIe emulation card is installed in the Macintosh. The "Mac Touch Window" can be used to access specific Mac programs.
[The Apple Touch Window is $275.00; Macintosh Touch Window and IBM Touch Windows are $335.00]

INNOCOMP
33195 WAGON WHEEL DR.
SOLON, OH 44139
216-248-6206

•**Say-It-Simply Plus**--This is an easily adapted and programmed augmentative communication device. The Simply Plus has text-to-speech capabilities and 8 optional voices (low to high pitch), and an adaptable keypad which can be programmed with "keys" from 1 X 1 inch to 12 X 12 inches.
[Cost is $1350.00]

•**Say-It-All II Plus**--This is a lightweight augmentative communication device (2.5 lbs.) which can store complete phrases and has multiple user capability. This device an be used with Touch 'N Talk or Bliss Symbol stickers. There are 846 user phrases and 8 possible voices (from low to high pitch).
[Cost is 1595.00]

PRENTKE ROMICH COMPANY
1022 HEYL ROAD
WOOSTER, OH 44691
800-262-1984

•**IntroTalker**--This is a small (5 lb.) augmentative communication device. It uses digitized speech, resulting in two minutes of recorded memory (additional memory can be added to eight minutes total). One minute roughly equals 30 short phrases. Within a year from original purchase, the IntroTalker can be traded in and upgraded for a Touch Talker.
[Cost is $940.00; trail rental policy for 4 week period]

•**Touch Talker**--Alternative communication device which can be programmed for individuals of all ages and cognitive levels. Can also be used as an environmental control device (e.g., to operate telephone, lights, etc.) and as an alternative computer keyboard. The Light Talker (prices vary from Touch Talker) has similar features yet can be accessed via switch (e.g., for scanning) or joystick. Both Touch Talker and Light Talker are available with Smooth Talker speech synthesizer or DECtalk speech (higher level of speech synthesis, offering a selection from 10 different age and gender voices).
[Cost with DECtalk is $4825.00; cost with SmoothTalker is $3965.00; trail rental policy is available]

•**Versascan**--This assistive communication device can be used for education, training, and/or evaluation purposes. Overlays, with pictures, words, or 3-D symbols can be developed which represent activities, phrases, choices of desired objects, etc. Using lamps to indicate scanning locations, the overlays can expand from 2-16 symbols. Access is through a single switch.
[Cost is $880, and includes two lamps]

STREET ELECTRONICS
6420 VIA REAL
CARPINTERIA, CA 93013
805-684-4593

•**Echo Speech Synthesizer**--The Echo is used to add synthesized speech to commercial software programs, such as the Early Learning and Laureate programs. It can also be used to create talking communication boards or add speech output to adapted programs, with the Unicorn and/or PowerPad. The Echo IIb is for the Apple IIe and Apple IIgs, and the Echo LC is for the Macintosh LC computer.
[Cost is $129.95 for either]

TASH, Inc.
70 GIBSON DR,. #12
MARKHAM, ONT L3R 4V2
CANADA
416-475-2212

•**King Keyboard**--This enlarged keyboard (almost 24" x 12") has 1-1/4" keys in diameter, which are slightly recessed on the board, are brightly colored for visual stimulation, and when pressed provide an auditory "click" feedback.
[Cost is $720.00]

•**Mini Keyboard**--This miniature keyboard has small, closely-spaced keys that can be activated with a light touch. It's small size enables access for users with a limited range of motion (versus a large keyboard).
[Cost is $375.00]

•**Switches**--A variety of switches are available, such as the Plate-Switch, a single membrane switch which only requires a very light touch to activate; the Tip Switch is a mercury switch which activates when the mercury is tilted down; the Pneumatic Switch is operated by a sip and puff; the Head Rest Dual Switch is mounted to the headrest of a wheelchair; and, the Wafer Switch, a multiple switch, consisting of five membrane switches enclosed in one unit.
[The Plate-Switch cost is $60.00; the Tip Switch is $60.00; the Pneumatic is $225.00 ; the Head Rest is $300.00; and the Wafer Switch is $170.00]

•**DADAEntry**--A keyboard emulator for IBM and PC compatibles. This device accepts various input methods including switches (e.g., for scanning) and alternative keyboards (including the TASH King and Mini and the Unicorn keyboards). It connects to the parallel port of the computer.
[Cost is $900.00]

UNICORN ENGINEERING, INC.
5221 CENTRAL AVE., SUITE 205
RICHMOND, CA 94804
800-899-6687

•**Unicorn Keyboard**--The Unicorn Expanded Keyboard (Model II) is a membrane keyboard that can be programmed from 128 keys to 2 keys, with an active area of 10" x 20". It can be used to access the computer with standard software, and as a writing and communication tool. Overlays can be developed to meet the individual needs of the user; works with the Adaptive Firmware Card and Echo Speech Synthesizer. The miniature version (Model 510) is approximately 50% smaller.
[The Unicorn Expanded Keyboard Model II is $350.00; Unicorn Keyboard Model 510 is $250.00]

•**Unicorn IntelliKeys**--Adaptive keyboard that runs with standard commercial software. Total active area is approximately 8" x 12". This keyboard does not require additional interface or hardware; it plugs directly into the keyboard port on the Apple IIgs, Macintosh, IBM, or compatible computer, and uses one of seven overlays to access software. Two switch jacks are built into the keyboard.
[Keyboard, with cables and overlays, is $395.00. Customizing software available Fall 1992.]

Partial Listing of Available
COMMERCIAL SOFTWARE for APPLE II COMPUTERS

(contact vendor or company for further information and a catalog of complete products)

Access Unlimited-SPEECH Enterprises
3535 BRIARPARK DRIVE, SUITE 102
HOUSTON, TX 77042
713-781-7441

•**KeyTalk**--(for elementary school-age) a beginning reading and writing program with speech feedback for letters, words, and sentences as they are typed
[program cost is $99.95]

•**Read-A-Logo**--(elementary school-age) logos and symbols from well known products and services (e.g., McDonald's, Campbell's Soup) are used to develop sight-word vocabulary. Two sets available (Level I is primary; Level II is middle elementary).
[program cost is $79.95 per set]

•**Representational Play**--(for young children) teaches word combinations and combines phrases into sentences; speech feedback with Echo.
[program cost is $150.00]

•**Survival Skills Software**--(any age) several software programs, which can be purchased individually or as a whole, consist of: Survival Words (e.g., poison); Survival Signs (e.g., don't walk; rest room); Information Signs (e.g., bus; use other door); Safety Signs (e.g., beware of dog; pedestrian crossing); Employment Signs (e.g., employees only); Transportation Signs (e.g., stop; school zone); and Community Signs (e.g., doctor's office; bakery; subway)
complete set costs $1,195.00; individual sets range $149.00 to $239.95]

•**Talking AppleWorks**--(any age) the AppleWorks Companion disk allows standard AppleWorks word processing to be run with DoubleTalk speech synthesizer (by SlotBuster II). This program requires AppleWorks--it does not run independently.
AppleWorks Companion disk is 49.95; DoubleTalk Synthesizer & SlotBuster II are $404.95]

EDMARK CORPORATION
P.O. BOX 3903
BELLEVUE, WA 98009-3903
800-426-0856

•**LessonMaker**--(any grade) uses Touch Window, speech feedback, pictures, and text to create individualized lessons. GraphicEditor modifies graphics and adds text.
[cost is $199.95]

•**SkillBuilder Series**--(elementary) includes Early Concepts SkillBuilder Series (picture vocabulary, cause-effect, matching, and discrimination); Communication Board SkillBuilder (touch screen as a communication board); and Vocabulary SkillBuilder Series (household items, food, clothing and body parts, family members, transportation, school, and animals). For use with Touch Window.
[Early Concepts is available in two sets containing four programs each for $179.95, or individual programs for between $39.95 to $64.95; Communication Board is $59.95; and the Vocabulary series is available for $29.95 each, or as a set for $179.95]

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LAUREATE LEARNING SYSTEMS, INC.
110 E. SPRING STREET
WINOOSKI, VT 05404
802-655-4755

•**First Words and First Words II**--(elementary) teaches various skills from cause-effect to vocabulary acquisition of nouns (ie: animals, body parts, clothing, common objects, utensils, food, toys, vehicles, household items, and outdoor items). Compatible with the Echo, and can be used with the TouchWindow and a single switch for scanning.
[each program cost is $200 for Apple IIe and $225 for IIgs]

•**First Verbs**--(elementary) teaches range of skills from cause-effect to vocabulary acquisition of verbs (ie: sensory/motor, communication, locomotion, actions, and recreation). This program is also available in Spanish. Compatable with the Echo, and can be used with the TouchWindow and single switch for scanning.
[program cost same as above; a bilingual package cost is $325]

•**Talking Picture Series**--(elementary) a series of three separate programs: Talking Nouns I, Talking Nouns II, and Talking Verbs. These programs come with overlays for either the TouchWindow or PowerPad and thereby provide an introduction to augmentative communication devices such as wordboards. Language development skills include picture identification, matching, and categorizing. Used with the Echo.
[each program cost for Apple II series is $115.00; Apple IIgs, IBM, or Tandy is $130.00]

•**First Categories**--(elementary) trains categorization concepts with either two or three pictures at a time. Categories include animals, body parts, clothes, food, utensils, and vehicles. Can be used with a single switch (in scanning mode), or the TouchWindow, with an Echo.
[Apple II series is $220.00; Apple IIgs, IBM, or Tandy is $225.00]

•**Twenty Categories**--(late elementary and up) uses multiple choice questions to teach categorization skills from large category to specific noun and vice-versa (e.g., Which is a dwelling: a son; a house; an ant). Can be used with the TouchWindow and Echo.
[program cost is $200.00]

•**CONCENTRATE! On Words & Concepts**--(any age) a computerized version of the game Concentration, using pictures and words. "Cards" can be matched by vocabulary, category, function, or word association (e.g., "key" and "lock"). Can be used with a single switch or the TouchWindow. Three separate programs are available.
[each program is $95.00; Apple IIgs, IBM, & Tandy are $105.00]

MARBLESOFT
21805 ZUMBROTA N.E.
CEDAR, MN 55011
612-434-3704

•**Early Learning I, II, and III** (primary)--Level I begins with color, shape, number, and letter matching; Levels II and III teach addition, subtraction, sequencing, and greater than/less than. All programs can be used with single-switch, Power Pad, Touch Window, and Echo.
[Early Learning I is $75.00; Early Learning II and III are $57 each; overlays are extra]

•**Mix 'n Match** (primary)--matching, sorting, and sequencing skills. Compatable with the Power Pad and Touch Window.
[Program cost is $57.00; overlays are additional]

•**Money Skills** (middle elementary)--teaches money recognition, counting and making change. Compatable with the Power Pad and Touch Window.
[Program cost is $47.00; overlays are additional]

•**Early Learning 3.5** (elementary)--package of 5 programs described above. Speech output with Echo or Cricket speech synthesizers. Includes overlays.
[Package is $200.00 for the 5.25"; $165.00 for 3.5" disk]

WEEKLY READER SOFTWARE
OPTIMUM RESOURCE, INC.
10 STATION PLACE
NORFOLK, CT 06058
800-327-1473

•**StickyBear Series**--(preschool thru elementary) several separate programs: StickyBear Opposites (ages 3-6); StickyBear ABC (ages 3-6); StickyBear Shapes (ages 3-6); StickyBear Numbers (ages 3-6); StickyBear Talking Alphabet (ages 3-6); StickyBear Reading Comprehension (ages 8-11); StickyBear Drawing (ages 7+); StickyBear Parts of Speech (ages 8-12); StickyBear Math (grades 1-4); StickyBear Math II (ages 7+); StickyBear BASIC (ages 9+); StickyBear Town Builder (ages 6-9); StickyBear Printer; StickyBear Typing; StickyBear Picture Library; StickyBear Reading (ages 5-8); and StickyBear Spellgrabber (grades 1-3). The Numbers, Shapes, Opposites, and Alphabet programs all are compatible with the Echo.
[programs range from $39.95 to $49.95]

Partial Listing of
PUBLIC DOMAIN SOFTWARE

(The following list is only a small sample of the available public domain and shareware programs that can be obtained from vendors, user groups, and software libraries. Contact individual agencies for further information on available programs.)

•**All About Shapes**--programs requires single switch to select from and match to four shapes; Echo is optional.

•**Alphabet, Numbers**--five programs are on this disk (Large Alphabet; Small Alphabet; Numbers; Keys; Preschool) that cover letter matching, counting objects, and lower and upper case letters; can be used with a single switch or keyboard.

•**Catch the Cow**--this program trains row-column scanning and is used with a switch.

•**Cause-Effect**--ten programs that focus on cause and effect are on this disk (Step, Noises, Visual, Music, Free Throw, Stop That Cow; Plotter, Anti-aircraft, Counter, and Frog & Fly); accessed with a single switch and Echo.

•**The Dancer**--when the switch is pressed, a dancer appears on the screen and "dances" to music; operated by a single switch and uses the Echo.

•**Early and Advanced Switch Games**-- (Shareware Program available from R.J. Cooper) contains 13 programs which focus on cause-effect, scanning, and matching; all programs work with a single switch and Echo.

•**Four Corners**--by dividing the keyboard into four sections (upper left, lower left, upper right, lower right), and hitting any key in those sections, a picture appears in the corresponding section on the monitor.

•**FireOrgan**--operated by hitting any key on the keyboard; hitting a key starts a "light show" on the monitor and the spacebar freezes the picture.

•**Fire Works**--three switch activated programs which provide different pictures (e.g., simulated fire works show) when the switch is pressed.

•**Ghost Story**--language arts program which encourages student to create stories by completing sentences with their own thoughts. The completed story can be printed.

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•**Interaction Games**-- (Shareware Program available from R.J. Cooper) switch accessed program which allows two players to "compete" against each other in several games.

•**Kidstuff**--six programs (Starfrog, Munch Mouse, Xmas Tree, Flutterbye, Dino Math, and Kidword) that work with the keyboard, number keys, arrow keys, and spacebar; involves placing and moving around pictures on the screen, and begins to work on simple math and writing problems.

•**Motor Training Games**--fourteen programs (Anti-aircraft, Tic-Tac-Toe, Bumper Cars, Hi-Res Draw, Low-Res Draw, Free Throw, ABC Dragon, Word Burner, Davy's Digits, Frog & Fly, Random Tones, Random Colors, and Color/Tones) are all accessed via one or two switches; a Motor Training Manual is also available.

•**New Cause & Effect Disk**--switch accessed programs which have brightly colored graphics with musical songs and a variety of auditory feedback (e.g., funny noises) which are activated when the switch is pressed. This program also allows for turn-taking interactions through the use of two switches.

•**Police Artist**--matching pictures of "robbers" through a scanning program; operates with keyboard

•**Switch and See**--teaches cause and effect; when a switch is pressed, a young girl dances or skips across the screen to music.

•**Swich Pictures and Music**--an early learning (e.g., preschool-kindergarten age appropriate) switch activated program which illustrates a clown's face and gives auditory feedback of song "Happy and You Know It".

•**Talking Keys**--the standard keyboard can be "reprogrammed" to represent whole words or sentences with the touch of a single key.

•**Teenage Switch Progressions**--(Shareware Program available from R.J. Cooper) contains several programs (e.g., making popcorn, playing basketball, putting on makeup) which all use a single switch to activate a picture on the monitor; also works with an Echo.

•**White Lodge Early Learning**--three programs (Dot-to-Dot, Matching Games, and Sequencing) focusing on same and different; operates with one or two switches.

•**White Lodge Math**--Five programs (Counting Games, Counting with Men, Rocket, Balls, and MooBaa) focus on identifying numbers and counting objects; uses switches and the keyboard.

RESOURCES FOR PUBLIC DOMAIN SOFTWARE

Contact the following agencies for information or copies of shareware or public domain software, including catalogs of the programs. All of the following are for Apple computers unless otherwise indicated.

Access Unlimited
3535 Briarpark, Suite 102
Houston, TX 77042-5235
713-781-7441 or 800-848-0311

Advantage Computing
1803 Mission Street, Suite 416
Santa Cruz, CA 95060
800-356-4666

Boston Computer Society
One Kendall Square
Cambridge, MA 02139
617-252-0600

Colorado Easter Seals
5755 W. Alameda Ave.
Lakewood, CO 80226
303-233-1666

Connecticut Rehabilitation Engineering Center
78 Eastern Boulevard
Glastonbury, CT 06033
203-657-9954 or 203-659-1166

DynaComp, Inc.
178 Phillips Road
Webster, NY 14580
800-828-6772

Easter Seals Society
Ina Williams
P.O.Box 333
1161 Fortyfoot Road
Kulpsville, PA 19443
215-368-7000

EDUCORP
7434 Trade Street
San Diego, CA 92121
800-843-9497

Facts on File, Inc.
460 Park Avenue South
New York, NY 10016
212-683-2244 or 800-322-8755

Public Brand Software
P.O.Box 51315
Indianapolis, Indiana 46251
800-426-3475
[Note--for IBM and compatibles]

Public Domain Exchange
Apple and Mac Software Library
P.O.Box 70
Alviso, CA 95002
800-331-8125

R.J. Cooper & Associates
24843 Del Prado, Suite 283
Dana Point, CA 92629
714-240-1912

Technology for Language & Learning
P.O.Box 327
East Rockaway, NY 11518-0327
516-625-4550

HARDWARE AND SOFTWARE WAREHOUSES

(MAILORDER & CATALOGS)

•Quality Computers
P.O.Box 655
St. Clair Shores, MI 48080
800-443-6697

Educational software for Apple and Macintosh computers. Enhance, free, bimonthly newsletter, includes information about available software as well as letters and brief articles on educational technology.

•MacWarehouse
P.O. Box 3013
1690 Oak Street
Lakewood, NJ 08701-3013
800-255-6227 or 908-367-0440

Complete line of products, software, and equipment, all at discount prices, specifically for Macintosh computers.

•Educational Resources
1550 Executive Drive
Elgin, IL 60123
800-624-2926 or 708-888-8300

Supplier for educational software and accessories, for both Apple and IBM computers (including PC clones).

•Learning Services
P.O.Box 10636
Eugene, OR 97440-2636
800-877-9378 or 800-877-3278

Software and accessories for Apple, Mac, and IBM PC computers.

TECHNOLOGY RESOURCES

•American Foundation for the Blind
15 W. 16th Street
New York, NY 10011
212-620-2143

•Apple Computer, Inc.
Office of Special Education and Rehabilitation
20525 Mariani Avenue
Cupertino, CA 95014
408-974-7910

•Center for Adaptive Technology
15 W. 65th Street
New York, NY 10023
212-873-1409

•Center for Children in Technology
Bank Street College of Education
610 W. 112th Street
New York, NY 10025

•CompuServe
P.O. Box 20212
5000 Arlington Center Blvd.
Columbus, OH 43220
800-818-8199

•The Computer Center for the Visually Impaired
Baruch College
17 Lexington Avenue
Box 515
New York, NY 10010

•Educational Resources Information Center (ERIC)
2440 Research Blvd., Suite 550
Rockville, MD 20850
301-590-1420

(TECHNOLOGY RESOURCES--continued)

•New York State Department of Education
Office of Vocational Rehabilitation
One Commerce Plaza
Room 1907TT
Albany, NY 12234
518-474-2714

•New York State Education Department
Office of Education of Children with Handicapped Conditions
Room 1073, Education Building Annex
Albany, NY 12234-0001
518-474-5548

•National Support Center for Persons with Disabilities
IBM Educational Systems
411 North Parkway
Atlanta, GA 30327
800-IBM-2133

•SpecialNet
2021 K Street, NW, Suite 315
Washington, DC 20006

•UCP of New York City
Technology Resource Center
120 E. 23rd Street (#2)
New York, NY 10010
212-979-9700

•Trace Research and Develoment Center
Waisman Center, Room S-151
1500 Highland Avenue
Madison, WI 53705

PUBLICATIONS

•Augmentative and Alternative Communication Journal (ACC)
The Williams & Wilkins Company
428 East Preston Street
Baltimore, MD 21202

•Closing the Gap
P.O. Box 68
Henderson, MN 56044
612-248-3294

•Communication Outlook
Artificial Language Laboratory, Computer Science Department
Michigan State University
East Lansing, MI 48824
517-353-0870

•Computer Disability News
National Easter Seal Society
70 W. Lake Street
Chicago, IL 60601
312-726-6200

•Journal of Special Education Technology
Special Education Department
Box 328
Vanderbilt University
Nashville, TN 37203

BULLETIN BOARDS AND USER GROUPS
for Apple Computers

The following resources are user groups which can be accessed via a modem on your computer. Each group has an annual fee, which may vary depending upon the type of membership choosen (e.g., individual versus group). Networks are good sources of public domain software and also provide valuable information.

The Big Apple Users Group (BAUG)
affiliate of New York Amateur Computer Club
P.O.Box 1822 Old Chelsea Station
New York, NY 10113
212-316-1830

The National AppleWorks User's Group (NAUG)
Box 87453
Canton, MI 48187
313-454-1115

The National Unicorn Users Group
6331 Fairmount Avenue
Suite 332
El Cerrito, CA 94530

SpecialNet Bulletin Board
GTE Education Services
8505 Freeport Parkway
Irving, TX 75063
800-634-5644 or 214-929-3081

Technological Resources for Students with Deaf-Blindness and Severe Disabilities

Annotated Bibliographies

Annotated Bibliographies

The following annotated bibliographies represent a compilation of selected literature on the applications of technology for individuals with severe disabilities. The annotated bibliographies are arranged in four sections: (1) Adaptive Technology: General Issues Pertaining to Students with Disabilities; (2) Microcomputer Technology in the Classroom; (3) Technology and Augmentative Communication; and, (4) Microcomputers, Switch Access, and Environmental Control.

Whereas the field of adaptive technology is in a constant state of change, it is ultimately most appropriate to think of this review as a "work-in-progress", since it will need to be continually updated and revised as new advancements and tools are developed. What is included as new and innovative in today's review may very likely be out-of-date within a brief period of time. The literature reviewed in this manual represents a small sample of the technology-based work that is actually being done everyday by and with individuals who have severe disabilities. Yet, it is the documentation of this work, that will actually provide readers of this and similar reviews with the substantial and empirical information required to identify "best practices", and to most appropriately implement technology-based programs. It is with this goal in mind that the following materials were reviewed.

Adaptive Technology: General Issues Pertaining to Students with Disabilities

1. Behrmann, M. M. (1992). Executive summary: Assistive Technology Resource Center. Report submitted to the Virginia Department of Rehabilitative Services, Virginia Assistive Technology System. Virginia: George Mason University, Center for Human disAbilities.

This report provides definitions and summaries of legislation regarding assistive technology (AT) devices and services. Funding and cost issues are discussed. Policy development is outlined, beginning with Section 504 of the Vocational Rehabilitation Act of 1973 and progressing to the most recent Individuals with Disabilities Education Act of 1990 (PL 101-476). Fourteen AT programs throughout the state of Virginia are described. AT is defined to include devices or equipment that enable individuals with disabilities to have greater control over their lives, to participate in daily activities, to interact with other persons who do not have disabilities, and to take advantages of opportunities in daily life.

Statistics cited include: 92% of survey respondents (in special education preservice programs) indicated a need for technology training; special education technology degree programs include only 7 undergraduate, 8 masters, 3 doctoral, 2 specialist, and 1 post-doctoral training program; less than half of all teachers nationwide have used computers; in Virginia, funding is the most significant problem associated with AT (second to the lack of trained professionals to deliver services).

2. Behrmann, M. M., and Lahm, E. (1984). Using computers with young and cognitively low functioning children. In M. Behrmann (Ed.), Handbook of microcomputers in special education. Boston: Little, Brown, & Company.

Young children (0-4 years old) and students identified as "cognitively low functioning" utilize some similar technological applications and interventions. Educational goals for both populations include increasing self-help and motor abilities, communication and social skills, and early cognitive skills. Theories of skill acquisition are reviewed, including: (1) developmental constructs based on Piaget; (2) "cumulative learning" which addresses an individual's life experiences and functional skills; and (3) "social learning" based on imitation and modeling skills. The question of "critical periods of learning" is addressed as a rational for early intervention. Technology can be used to promote learning, communication, and environmental control during these critical periods.

One possible reason for the absence of in-depth research on the quality and efficacy of using technology is that the field is relatively new. A few studies are cited, such as: (1) a study which finds there is no statistical significance between IQ and ability to use a keyboard as input ; (2) inclusive data from a study which attempted to identify increases in rate of responses on computer-oriented tasks by persons with profound retardation and physical disabilities; (3) a study which indicated that young children, 11 and 30 months old, were able to consistently use single switch input to access programs on a computer.

3. Blackhurst, A. E., Copel, H., Mittler, J. E., Robinson, S. L., & White, O. R., (1989). E. A. Lahm (Ed.), Advancing technology use: Barriers to research utilization. Reston, VA: Center for Special Education Technology, Council for Exceptional Children.

This paper is based on the June 1989 annual technology symposium sponsored by the Center for Special Education Technology. The paper is divided into 3 sections.

Section 1, *Barriers to Technology Implementation,* covers the history of technology in education and discusses general barriers to the implementation of technology-based educational activities. Barriers include equipment, implementation, teacher training, stereotypes, and preconceived notions of teaching and the classroom environment.

Section 2, *Implementing Technology in Special Education: Barriers and Promoters*, describes issues raised at a public hearing regarding the implementation of the Tech Act in Kentucky. Three barriers were identified, focusing on the lack of trained personnel, lack of knowledge regarding assistive technology (AT), and lack of funds. A previously conducted studied (of 276 higher education programs) reported poor implementation of technology programs. Respondents indicated that college faculty were not prepared to teach their students about technology (89%); faculty lacked skills and knowledge about technology (85%); there was access to computers (94%) but the financial resources to purchase software were inadequate (87%); there was not room in the curriculum to address technology (82%); and, the need for training regarding applications of technology for students with disabilities (82%).

Section 3, *Barriers and Potential Solutions for Moving Technology Research into a Practice Setting*, focuses on transferring research into practice. Participants in the symposium identified the barriers involved in moving from research to practice and the solutions for successful implementation. Barriers included: limited collaboration between researchers and practitioners; problems with inservice training; funding; technical problems with computers and equipment; and, problems with implementing technology-based activities. Solutions included: sharing responsibilities and collaboration between researchers, practitioners, and developers; support from the federal government; changes in preservice and inservice training; and, development of more affordable equipment.

4. Blackhurst, A. E., MacArthur, C. A., & Byrom, E. M. (1987). Microcomputing competencies for special education professors. Teacher Education and Special Education, 10(4), 153-160.

A 1986 survey revealed that while instruction in the use of microcomputers is identified as important for special education teachers, many faculty responsible for preservice preparation lack knowledge and skills regarding computers. Project RETOOL is one example of a program developed to provide microcomputer inservice training to special education faculty.

A questionnaire of 43 computer competencies was developed and sent to 250 faculty of special education. Results indicate two competencies identified as very critical: "teaching how to integrate microcomputer use into curricula for exceptional children and being able to select and demonstrate software programs appropriate for exceptional children." The highest rated competency was being able to use a word processor (94.6%) and the lowest rated was writing computer programs using languages such as BASIC.

5. Cress, C. J., & Goltz, C. C. (1991). Cognitive factors affecting accessibility of computers and electronic devices. In C. J. Cress, C. C. Goltz, J. P. Tew, & G. J. French (Eds.), Cognitive access to computers: Selected research, design, and application papers. Madison, WI: Trace Reprint Series, Trace R & D Center, University of Wisconsin-Madison.

This paper identifies several ways to reduce cognitive demands of computer use. The problem of cognitive demand, and incompatibility of software and hardware, is described through a case example. Recommendations for designing software and hardware are based on current rehabilitation and educational literature.

Input/interface control recommendations include: decreasing complexity of input techniques by using a touch window, touch pad, light pen, programmable keyboard, and voice activation; reducing items and number of choices on menu; presenting choices in

consistent methods; providing feedback; limiting key requirements; etc. Presentation format recommendations include: reducing complexity of display; providing voice output for instructions and feedback; grouping and highlighting important information; using animation, contrast, color cues, arrows, flashing lights, etc.; utilizing highly motivating features and reinforcement; limiting need for simultaneous activities; and, providing flexibility in symbolic representation (e.g., words, pictures, symbols, voice, etc.). Informational content and prompting recommendations include: matching vocabulary and grammar to user's cognitive abilities; minimizing complexity of concepts; providing repetition; allowing various options for time limits; simplifying sequences; increasing automatic or default items; and, including help screens throughout the program.

6. Cress, C. J., & Goltz, C. C. (1991). Tips for selecting and evaluating software. In C. J. Cress, C. C. Goltz, J. P. Tew, & G. J. French (Eds.), Cognitive access to computers: Selected research, design, and application papers. Madison, WI: Trace Reprint Series, Trace R & D Center, University of Wisconsin-Madison.

This paper presents suggestions on ways to obtain information about software programs prior to purchase. The purchaser should: (1) identify needs and set goals; (2) check available resources (e.g., software directories; computer magazines) for information and software reviews; (3) network with other computer users; (4) use a sample copy or preview of the program before buying (check with libraries and resource centers); (5) observe students using the program; and, (6) review documentation or manuals. A checklist for evaluating software programs covers topics of "Usefulness/Overall Quality"; "Teaching Techniques", "Presentation Style", "Flexibility/User Control", "Program Requirements", "Motivation", "Documentation", and "Technical Quality".

7. Cress, C. J., French, G. J., & Tew, J. P. (1991). Age-related differences in interface control in normally developing children. Paper presented at the 14th Annual RESNA Conference, Kansas City, MO.

This paper presents a study of 29 nondisabled young children using five different types of computer interfaces in four different tasks. The aim was to identify: (1) which interfaces are fastest and easiest for young children to learn; (2) how a particular type of interface varies between age levels; and, (3) learning styles and error patterns. The touch screen was noted to be the faster mode of input in comparison to the keyboard and mouse. Children below 48 months of age failed more frequently than older children in acquiring skills to complete certain tasks. Other studies are cited which indicate that very young children are able to access a touch window before they can successfully use any other input device. Scanning techniques are noted to be cognitively more difficult than direct selection.

8. Orelove, F. P. (1991). Educating all students: The future is now. In L. H. Meyer, C. A. Peck, and L. Brown (Eds.), Critical issues in the lives of people with severe disabilities. Baltimore, MD: Paul Brookes Publishing Co.

Upon examining the implementation of technological devices in educational programs, concern is raised that switches are often inappropriately used or used in a manner unrelated to the student's educational goals. This brings to light the need for a team of professionals to plan carefully when deciding whether or not switch access should be introduced to an individual student. The limitation of technology to switch-activated toys and environmental control devices implies an obvious lack of more sophisticated, albeit affordable, microcomputer applications for students with challenging and multidimensional educational, social, and vocational needs. Additional concerns lie in the fact that there is little research which investigates the scope and appropriateness of using microtechnology with students having severe disabilities.

9. Parette, H. P., & VanBiervliet, A. (1992). Tentative findings of a study of the technology needs and use patterns of persons with mental retardation. Journal of Intellectual Disability Research, 36, 7-27.

Technology can offer three benefits to persons with mental retardation: (1) facilitate educational and therapeutic activities; (2) support or supplement physical abilities; and (3) promote integration and participation. PL 100-407 is reviewed, a definition of technology is presented, and specific regulations are covered. The definition includes devices and/or services that enhance one's quality of life and facilitate "ultimate functioning". PL 100-407 is a grants program which provides states with funding for technology-related assistance.

The Technology Access for Arkansans (TAARK) project is described. Goals included: (1) identify need for technology; (2) disseminate information; (3) provide education; (4) provide advocacy information; (5) develop state plan; and, (6) provide technical assistance. A state/federal needs assessment was conducted, involving 680 persons with mental retardation. Results from the consumer survey indicated that technology was used for "getting around" (73%); self help (69%); work/training (62%); recreation (59%); school (59%); talking with others (48%); and using a computer (21%). Expenses for technology were reported to be $500 or less. 32% of individuals reported they received inadequate training on their assistive device; only 10% of the school-age respondents indicated their school funded the AT device.

10. Parker, S., Buckley, W., Truesdell, A., Riggio, M., Collins, M., & Boardman, B. (1990). Barriers to the use of assistive technology with children: A survey. Journal of Visual Impairment & Blindness, 532-533.

This survey addressed teachers of students with multiple disabilities and deaf-blindness. The survey consisted of a 26-item questionnaire sent to 150 teachers and agencies in Massachusetts. Survey items included: knowledge of assistive technology (AT), ability to utilize AT, problems with use, and solutions. Results indicate that 79% of respondents had poor or nonexistent knowledge in electronic mobility aids; 75% had poor or no knowledge of electronic communication devices; 63% had poor or no knowledge of educational computers; and 53% had poor or no knowledge of switch-activated devices. 60% indicated they rarely or never used electronic communication devices; 50% rarely or never used switch-activated devices; and 48% rarely or never used computers with their students. Common problems were reported to include the availability and maintenance of devices, and the availability of information, funding, and purchasing (74-77%); 64% reported problems with on-site assistance; and 59% reported concerns regarding follow-up from consultants. Solutions included the need for assessments to match students with appropriate AT; training in the uses of AT; more information; personnel available to assist and support; on-site workshops; and resource centers for professionals and parents.

11. Smith, R. (1991). Training therapists in technology: Barriers and solutions from the third year of the TechSpec Program. Paper presented at the 14th Annual RESNA Conference, Kansas City, MO.

The notion that the demand for professionals knowledgeable in technology has exceeded the supply is presented. To fill this void, the University of Wisconsin-Madison developed a preservice training program in technology (TechSpec). The objectives of this program are to improve the training and technology skills of professionals entering special education and rehabilitation, and to develop and disseminate training materials for other programs. The TechSpec program, containing 6 core courses, aimed to graduate 6-15 "technology specialists" per year. Problems with the program are identified. Solutions to these problems have been targeted and are described.

12. Staff. (1991, no. 1). The education of children and youth with special needs: What do the laws say? NICHCY News Digest. (National Information Center for Children and Youth with Disabilities, Washington DC)

This newsletter provides detailed information on legislation pertaining to special education. Of particular interest is PL 100-457, The Technology-Related Assistance for Individuals with Disabilities Act of 1988 (Tech Act). The Tech Act aims to assist states in developing programs that provide technology-related assistance to individuals with disabilities and their families. "Assistive technology device" is clearly defined (and is the same language which the Individuals with Disabilities Education Act adopts to define AT devices and services). Title I provides states with funds to develop programs and services, such as model delivery systems, state-wide needs assessments, public awareness programs, training and technical assistance, resource information, interagency agreements, etc. Title II authorizes the development of various activities which support state services.

13. Staff. (1989, no. 13). Assistive technology. NICHCY News Digest. (National Information Center for Children and Youth with Disabilities, Washington DC)

This newsletter includes six articles on assistive technology (AT).

1. Technology: Becoming an informed consumer (E. Lahm & S. Elting) addresses adaptations. The range of available devices and equipment requires parents, consumers, and professionals to make informed decisions and choices. Resources to assist in decision-making include periodicals, disability organizations, national centers, etc. The evolving field of computers is discussed, dating back to the first computers of the late 1930's, and its relationship to people with disabilities (e.g., the first conference on computers for individuals with disabilities was held in 1981). Legislation pertaining to AT is reviewed, including PL 94-142, PL 99-457, and PL 100-407. Three case studies are presented. Different purposes of software are reviewed (e.g., drill and practice, tutorials, etc.), and suggestions regarding how to purchase equipment are discussed.

2. Assistive technology: A parent's perspective (J. Fleisch) addresses the needs of families with regard to funding of AT devices, finding support and assistance, keeping up with changing technologies, etc. Questions are presented which focus on the emotional issues, as well as the issues related to time, energy, and money of using technology. Technology is identified as an exciting tool which can help accomplish many things, yet it is not the sole answer to questions and concerns.

3. Federal legislation and assistive technology (R. Rice) outlines the federal legislation and mandates with regard to technology for all individuals with disabilities. Legislation covered includes: PL 99-506, PL 99-457, PL 99-509, PL 100-146, PL 100-297, and PL 100-407.

4. Effective use of technology with young children (M. L. Wilds) identifies how AT can be used to enhance interaction with infants and toddlers. Of primary concern is identifying the most appropriate use of, and physical access to, the AT device or computer. Assessment of motor skills, visual/perceptual skills, cognitive & language skills, and social skills is emphasized as is selection of switch toys and computer applications.

5. Integrating technology into a student's IEP (R. Bragman) identifies and defines categories of technology, including (1) sensory enhancers; (2) keyboard adaptations; (3) environmental controls; (4) instructional technology; and, (5) motivational devices. Student assessment and evaluation is discussed, comparing traditional considerations with technology.

6. Starting the funding process (S. Ripley) describes the most efficient and easiest ways to begin funding AT devices. These include finding a Client Advocate or Funding Coordinator.

Technology in the Classroom

1. Buckleitner, W. W., & Hohmann, C. F. (1987). Technological priorities in the education of young children. Childhood Education, 63, 337-340.

This article focuses on technology in the education of young children. The authors identify studies which indicate the positive benefits of quality early education programs as well as the benefits of student-initiated (vs. teacher-directed) early education activities. The microcomputer offers young children various instructional options which reflect best practices. The High/Scope Curriculum Demonstration Project Study revealed that computers facilitate cognitive development and social interaction in young children. Computers can be integrated into the classroom as an "activity center" or free choice activity (e.g., similar to an art center or play area); used during small group instruction; story writing activities; circle time activities; and as a tool to support curriculum goals in general.

A 1985 survey indicated the growth in elementary school computers (e.g., those schools having 5 or more computers) to increase from 7% in 1983 to 54% in 1985. Also as of 1985 nearly 50% of the nation's preschool programs had microcomputers.

2. Buckley, W. L. (1992). Our kids use computers too! Paper presented at the Hilton-Perkins National Conference on Deaf-Blindness, Washington, DC.

The computer program at Perkins School for the Blind is described. Set up as a resource room, this program is available to all students. Students are scheduled to use the computer at least two times per week, either individually or with their class. The computer specialist provides assistance, while the teacher and aides work directly with students. Teachers are responsible for selecting appropriate software. The aim of computer related activities is to reinforce educational concepts (language, communication, and cognitive development). Computer-related activities, with specific hardware and software, are included on the student's IEP.

Examples of computer activities for students with deaf-blindness include: cause and effect; cognitive skills; and general computer concepts. Adaptive equipment is used to modify input and output, and to adapt standard software. A list of adaptive peripherals for the Apple computer is included, as well as a resource list of software programs used by students with deaf-blindness.

3. Cawley, J. F., & Murdock, J. Y. (1987). Technology and students with handicaps. Contemporary Educational Psychology, 12, 200-211.

Hardware and software modifications can support communication, interaction, and cognitive skill acquisition. Since technology is embedded in society, schools must now focus on providing opportunities for students with disabilities to learn and successfully use such tools. Technology can be used to augment, and even replace, traditional teaching practices and educational experiences. However, there is a lag between philosophy and implementation.

Current software applications for students with disabilities are considered poor, such that software tends to duplicate textbook material (e.g., drill and practice). Teachers can better meet individual needs by creating their own programs. Improvements in software and general applications of computer technology for students with disabilities can be seen in the recent development of networks, clearinghouses, resource groups, and periodicals . Technology takes many forms and has many applications for students with mild disabilities. The more sophisticated forms of technology (the computer) can be used to analyze language and communication; provide drill; increase vocabulary, reading, and spelling skills; and, develop perceptual, memory, and cognitive skills.

For students with severe disabilities, computers can be used for augmentative communication. Adaptive devices (e.g., headpointers; mouth sticks) can be used to access the computer for expressive communication. Receptive communication can also be aided (e.g., changing the rate of input to process information). Interactive video simulation has the potential to teach/support the acquisition of critical skills. A project at Utah State University utilized interactive videodiscs to teach students with mental retardation time telling, matching, coin identification, sight reading, and directions.

4. Cosden, M. A. (1989). Cooperative groups and microcomputer instruction: Combining technologies. The Pointer, 33(2), 21-26.

Cooperative learning and heterogeneous grouping of students can enhance academic performance and social interaction. As mainstreaming continues to increase, teachers must consider various instructional technologies. One option is the use of microcomputer-assisted instruction. Computers have been identified as tools which can be used to meet the individual needs and learning styles of students with disabilities. When used in group situations, computer-based activities can also promote social interactions. However, in recent years, as classrooms have increased the number of computers available, small group activities have decreased. Preliminary studies indicate student outcomes of small-group and cooperative-group computer activities include increased cognitive and social effects.

Microcomputers can be viewed as an instructional aide or tool, similar to cooperative-group instruction (e.g., to meet the needs of a heterogeneous group of students). Impediments to success in implementing both cooperative learning and technology-based activities center around the lack of effective training and supervision. Specific technology-based problems include: teachers lack of ability to modify software; difficulty integrating microcomputer instruction into classroom activities; and, software programs unrelated to other classroom activities.

The positive effects of grouping students in cooperative activities on the computer include managerial, economic, and social benefits. Small group computer activities also promote "help seeking" and "help giving" interactions between students (versus relying on the teacher). Most important is the impact cooperative groups have on social acceptance and social behaviors. Studies indicate that computer activities generate social interaction (students engage in "helping behaviors" and provide feedback to each other). The author notes "social interactions around the computer primarily occur when students are working in small-group configurations".

5. Cosden, M. A., & Abernathy, T. V. (1990). Microcomputer use in the schools: Teacher roles and instructional options. Remedial and Special Education, 11(5), 31-38.

Teacher dissatisfaction with technology has been identified to include: the limited number of available computers; poor quality of software; lack of inservice training; lack of time to develop programs; difficulty integrating computers into the classroom; and, problems implementing computer-based activities. Technology places demands on teacher time and resources. Therefore, it is imperative for teachers to "consider not only the capacity of the technology, but also the effort required to provide this instruction." As a result of hiring computer "specialists" who work in separate computer labs (vs. classrooms), teachers report they are not involved in the selection of software. This limits a teacher's ability to implement effective computer programs in the classroom, as well as the specialist's ability to effectively address educational needs. (Most computer specialists report high levels of technology-based expertise but little teaching experience).

The authors conducted a study aimed at identifying problems associated with microcomputer activities involving students with mild disabilities and students without disabilities. This study further proposed to develop recommendations to enhance effective

teacher practices with regard to implementing technology-based activities. Observations were conducted in classroom and computer lab settings. It was noted that of the students with disabilities, those in special education classes had access mostly to computers in their classrooms while students with disabilities in mainstream classes participated in computer activities in the computer lab.

Constraints of classroom-based computer use include the limited number of available computers, resulting in difficultly integrating the computer into the curriculum. Typically, the result is a small group of students working together on the computer while the rest of the class in working on a different activity. Lab set ups alleviate this particular problem, however, lab activities themselves tend to be separate from all other goals within the curriculum. Implications from this study include: (1) match software to student skills and goals; (2) increase teacher training and allow for release time to prepare computer-based materials; (3) promote cooperation and collaboration between classroom teacher and computer specialist; and, (4) use computers to enhance the curriculum.

6. Hofmeister, A. M., & Friedman, S. G. (1986). The application of technology to the education of persons with severe handicaps. In R. H. Horner, L. H. Meyer, & H. D. Fredricks (Eds.), Education of learners with severe handicaps: Exemplary service strategies. Baltimore: Paul Brookes Publishing Co.

While there is great potential for the use of technology in the education of persons with severe disabilities, little information exists. The field of technology is in a constant and dynamic process of change, and therefore, the role of technology in education needs to be continually evaluated and revised. Computer technology is discussed in terms of computer-assisted instruction (CAI) and computer-managed instruction (CMI). CAI is defined and described (e.g., provides feedback to the learner; is motivating and reinforcing; can replicate instruction). Technology can also augment communication; enhance visual, auditory, and tactile input and/or output; and promote leisure activities.

Two technology-based programs are described. The Interactive Videodisc in Special Education project (IVSET) of Utah State University includes a series of instructional videodiscs. Students can work on a range of cognitive skills (matching, telling time, money, etc.). Each software program maintains a record of student progress. The Goal-Based Education Management System (GEMS) program is based on CMI characteristics. The project aimed to analyze the progress of students, identify specific weaknesses, and increase learning through alternative teaching strategies.

Technology must be implemented in an appropriate and effective manner--not as a means of replacing teaching or teacher-student interactions. Other concerns include actual use (vs. sitting in a corner of the room) and high cost of equipment.

7. Lepper, M.R. (1985). Microcomputers in education: Motivational and social issues. American Psychologist, 40(1), 1-18.

Questions for research are based on theoretical assumptions which may guide the development of technology in education (e.g., what motivates children and sustains interest in instructional programs; what is the relationship between motivational appeal and instructional quality; and how will the spread of microcomputers affect the process of social development?). The author suggests that computers will eventually touch all children (as has the development of television), and therefore, research must be done quickly before certain types of fundamental questions can no longer be asked.

Many software programs are written to enhance student motivation. Instructional math games can be created on the computer to stimulate interest and motivation, versus teaching through drill and practice. Several other characteristics and theoretical basis of computer software are reviewed, including the use of educational simulations via the computer.

Social issues and the impact of technology are addressed. The notion of social equity is raised, in that computers may in fact increase the gap between "rich" and "poor" (e.g., because children from privileged families attend schools where computers are common place and children from underprivileged families attend schools that do not have money to spend on technology). Other concerns are raised, including the impact of technology on children's social interactions and social skills.

8. MacArthur, C. A., & Malouf, D. B. (1990). Microcomputer use in educational programs for mildly handicapped students. Preventing School Failure, 34(2), 39-44.

Research studies have demonstrated the use of computer-assisted instruction (CAI) for drill-and-practice activities at the elementary level. Yet, little research has been conducted on the impact of computers in the education of students with disabilities. Studies that have been conducted include descriptive studies (e.g., instructive uses of computers; effective uses of computers).

The purpose of this study was to identify critical issues involved in implementing computer activities for students with mild-moderate disabilities, and to describe patterns of computer use. The researchers aimed to identify teacher perceptions, barriers, and supports leading to effective programs. Data was collected through participant observations and interviews. Major uses included: CAI; computer literacy; programming; word processing; and, problem solving. Data also revealed that in elementary schools computers were used similarly by regular and special educators (e.g., in the classroom, used for CAI). In secondary schools, computer use between regular and special education differed. Regular education programs used computers to teach computer literacy, programming, science, math, and vocational skills; special education activities included introductory programming; CAI; and word processing. Factors contributing to computer use included: setting (classroom vs. lab); availability of hardware, software, and other resources; and, teacher training (typically inservice training focused on programming in BASIC, which was deemed irrelevant by most teachers).

Benefits of computer-based activities, as rated by teachers include: increased motivation (85%); increased achievement (81%); individualized instruction (46%); social-emotional effects such as self-image and social interactions (46%); etc. Negative effects of computer use included development of an "arcade mentality" and issues regarding implementation (e.g., access issues, training, identification of appropriate software, etc).

9. McGregor, G., & Axelrod, S. (1988). Microcomputers in the classroom: Teaching students with severe handicaps to use a computer. Education and Treatment of Children, 11(3), 230-238.

While some research has been conducted on the use of computers in the classroom by students with mild disabilities, there remains a strong need for empirical research on the applications of microcomputer use by students with severe disabilities. Skills and areas which can be addressed through computer-assisted instruction (CAI) include functional academics, vocational skills, and recreational activities. In order to effectively utilize microcomputer technologies, teachers must be comfortable with and capable of handling equipment. Teachers identified the number one priority for inservice training on computers as learning how to operate a computer and run commercially available software.

This study focused on teaching three teenage students with moderate to severe disabilities how to load a piece of recreational software, play the game, and shut down the computer. Initially, all students required some amount of assistance to complete the steps of inserting the disk and turning the power on. Data indicate that all students learned the necessary skills, and were able to maintain the skills over time. This study demonstrates that students with severe disabilities can learn how to turn on and operate a computer, impacting their ability to use a computer in an integrated educational setting.

10. Panyan, M. V., Hummel, J., & Jackson, L. B. (1988). The integration of technology in the curriculum. Journal of Special Education Technology, IX(2), 109-119.

When planning instructional activities, careful consideration must be given to the educational curriculum, instructional activities, inservice training of teachers, and support of administrators. Without such guidelines, innovations may become problematic. For example, there is currently an absence of validated CAI implementation procedures, resulting in "instructional fragmentation" across school settings. This paper presents a model for instructional integration of CAI in classroom environments.

Two steps are described. The first is the identification of major outcomes for effective computer instruction. This includes the relationship to the IEP; relationship to the classroom setting; students ability to generalize skills learned on the computer; integration with other instructional activities (e.g., embedded in a program that provides both CAI and non-CAI activities); and, support from administration regarding materials, training, and supervision. The second is the development of a conceptual framework which delineates the important variables and research issues. Such a framework can serve as the basis for validating "best practices" regarding CAI and integration of technology into the curriculum. Outcomes associated with instructional activities include the role of the teacher and the activities in all levels of instruction (from administrative to direct learning). A decision-making process is described as a basis for integrating CAI into the classroom.

The decision-making process includes identifying the instructional content, specifying and organizing the learning experiences, and evaluating the learning experiences. In addition to the decision-making process, a 16-cell decision matrix is described. Five elements for research of this model include: (1) identifying the ways in which software can be used to meet student IEP objectives and curriculum goals; (2) the blending of CAI and non-CAI activities; (3) collaboration between regular and special educators, especially to use technology as a tool to promote mainstreaming and student integration; (4) independent use of CAI, including self-monitoring and self-evaluation; and, (5) impact on teacher competencies and the need for technological support.

11. Spiegel-McGill, P., Zippiroli, S. M., & Mistrett, S. G. (1989). Microcomputers as social facilitators in integrated preschools. Journal of Early Intervention, 13(3), 249-260.

Due to specific physical disabilities and/or severe communication impairments, social opportunities are very limited for children with severe disabilities. A mainstreamed environment is not enough to ensure social interaction between children with and without disabilities. Microcomputers, however, have the potential to promote social interaction. "The microcomputer's adaptability and reactive characteristics could make it an integral part of a mainstreamed preschool environment."

The Special Friends and Computers Project, a 3-year project, is one example of a model program which used computers and other forms of technology to promote social interaction between children with severe disabilities and peers without disabilities. The study conducted by these authors aimed to compare the effects of different play situations on the amount of time children with and without disabilities interacted. In two of the play situations, a technology-based toy was turned on and available; in the third situation both activities were present but turned off. Children in the study were paired in dyads. The three play conditions compared were (1) computer on and the robot available but off; (2) the robot on and the computer off; and (3) both the computer and robot available but off. Results indicate that dyads engaged in more socially directed behaviors when using the computer than in other play situations, suggesting that microcomputers can support the development of social interaction between children with severe disabilities and their nondisabled peers.

Technology & Augmentative Communication

1. Dattilo, J. (1986). Computerized assessment of preference for severely handicapped individuals. Journal of Applied Behavior Analysis, 91(4): 445-448.

This study focused on creating new opportunities for individuals with severe handicaps to choose desired recreational activities by indicating their preference via microswitch activation. This study involved 3 students, ages 6 to 10 years, who all had severe mental retardation and physical or sensory impairments. Using an Apple IIe computer and microswitches, data was collected on the number of switch activations per software program. The experimental conditions consisted of visual-auditory, visual-tactile, and tactile-auditory. The number of switch activations were actually recorded by the computer, thus facilitating accurate and automatic tabulation per condition. By analyzing this data, one could systematically and objectively identify which activities were most preferable to the individual student, and use these activities to generate additional educational and recreational goals. Using switches, individuals are able to indicate their preference for particular activities.

2. Einis, L. P., & Bailey, D. M. (1990). The use of powered leisure and communication devices in a switch training program. The American Journal of Occupational Therapy, 44(10): 931-934.

This case report illustrates the story of a 25-year old woman who was introduced to switch-operated recreational and communication devices. Once evaluated for switch control and communication enhancement, this woman was able to increase her expressive vocabulary from 16 pictures and a "yes/no" response to approximately a 250-picture augmentative communication system. Additionally, she learned to control devices in her environment via switch access, thereby increasing her functional independence. Her exposure to switches did not occur until after she was 22 years old. This article emphasizes how "low-tech" devices such as microswitches are many times not offered as possible interventions for individuals with very severe disabilities.

3. Goossens', C. & Kraat, A. (1985). Technology as a tool for conversation and language learning for the physically disabled. Topics in Language Disorders, 6(1), 56-70.

Technological advances continue to increase access to microcomputers and adaptive communication devices for individuals with physical disabilities. Adapted input devices can be controlled by eye blink, muscle movement, eye gaze systems, etc. Adaptive output includes interface with modems and speech synthesis. Other dedicated devices address needs of environmental control, mobility, and communication. Problems and concerns regarding technology are that "technology is used solely as a means to an end...rather than an end in itself (e.g., as a vehicle for effective and efficient conversational exchange)". Technology should also be used as a tool for learning language: preschool children can be taught language concepts via software programs; children with physical disabilities can be taught to use a computer with single switch to request preferred toys; augmentative communication devices can be used to increase skills in asking questions.

Advantages of electronic systems include: motivation from speech output; multisensory learning; quick access to vocabulary words (through multiple levels of programming a single cell); quick access to whole sentences via one keystroke; letter or word prediction to increase rate of input; communicative autonomy via different output modes. Variables regarding efficient programming of the device depend upon the individual user and include: the number of selections a person can make; time to make a selection; and, type of symbolic representation.

4. Hagen, D. (1984). Jason says "yes". The Pointer, 28(2), 40-43.

This article discusses how the Apple computer can be adapted to meet individual needs of children with disabilities. A child with cerebral palsy and limited motor ability can access the computer with one hand. As an example, Jason, a 7-year old boy with visual impairments and cerebral palsy, is described to use an adapted computer for choice making and cause-effect activities. The computer system included an adaptive keyboard and speech synthesis. Selecting appropriate software and adding speech synthesis, the computer can be turned into a highly motivating teaching tool. The Adaptive Firmware Card (AFC) is one peripheral device which allows the computer to be adapted for different input modes (e.g., single and multiple switches). In addition, the microcomputer, paired with a modem, provides a user who has severe disabilities with a range of outreach capability (e.g., E-Mail; electronic banking; and other telecommunication abilities).

5. Larson, V. L., & Steiner, S. (1985). Language intervention using microcomputers. Topics in Language Disorders, 6(1), 41-55.

Speech and language pathologists must be able to decide whether, when, and how to incorporate microcomputer technology into their therapy programs. The computer is a viable tool for use by speech-language therapists. Competencies include: knowledge of hardware, software, and peripheral devices; knowledge of computer use in rehabilitation and education; ability to evaluate software and create new software; ability to integrate computers with other intervention goals; ability to learn new applications and tools; and, understanding the ethical and legal implications of technology. This article identifies many of the companies that publish software for language intervention. Software can focus on drill and practice, simulation, tutorial activities, instructional games, problem-solving activities, and/or exploration and discovery.

Four case studies are presented in which the computer is utilized as a tool for language intervention. The individuals presented include two children, an adolescent, and an adult, all using computers with varied programs.

6. Mathy-Laikko, P., Iacono, T., Ratcliff, A., Villarruel, F., Yoder, D., & Vanderheiden, G. (1989). Teaching a child with multiple disabilities to use a tactile augmentative communication device. Augmentative and Alternative Communication, 5(4), 249-256.

This study addresses the use of tactile input as a form of augmentative communication for children with deaf-blindness and multiple disabilities. Specific questions aimed to: (1) assess the preferred tactile surface on a single switch (given a choice of four) for an individual with deaf-blindness and severe-profound cognitive and physical impairments; and, (2) determine if pairing the child's motor movement (e.g., switch press) with a social response from the caregiver would result in increased motor movements. This study involved one 8 year old girl with cerebral palsy, severe motor impairment, profound mental retardation, blindness, and hearing impairment. The girl was given four switches, each covered with a different texture, connected to a computer with speech synthesizer. Once she demonstrated a preference, her switch activations were then paired with a social contingency. The study revealed that she was able to develop a preference for certain tactile surfaces, and when paired with social interaction, she increased her use of the preferred tactile switch. This suggests that tactile surfaces may serve as symbolic representations for individuals with deaf-blindness, and such symbols could be incorporated into an AAC system (e.g., to request items and activities; to interact with people and the environment). For this particular student, single switch technology provided her with a means of initiating interaction with her caregiver.

7. Meyers, L.F. (1990). Technology: A powerful tool for children learning language. OSERS News in Print, 3(2), 2-7.

This article focuses on the design and implementation of teaching strategies which use technology to promote the development of spoken and written language. Technology is offered as a medium through which children with disabilities can learn the "links" between word meaning, word sounds, and printed words. Computer technology can help children with disabilities construct sentences and convey meaning. The computer is a highly motivating tool which can add graphics and sound to written text. Speech output provides a "voice" for students who can not communicate verbally; it also can be used to teach articulation and sequencing of sound patterns. With the array of available adaptive devices, students with disabilities can use computers to generate text independently.

8. Mustonen, T., Locke, P., Reichle, J., Solbrack, M., & Lindgren, A. (1991). An overview of augmentative and alternative communication systems. In J. Reichle, J. York, and J. Sigafoos (Eds.), Implementing augmentative and alternative communication: Strategies for learners with severe disabilities. Baltimore, MD: Paul Brookes Publishing Co.

An overview of augmentative and alternative forms of communication is provided, and specific information on electronic communication devices is discussed. It is noted that speech output with an electronic communication aid provides many advantages. Foremost among these is giving the individual a "voice" with which he or she can gain a listener's attention, more readily communicate a need, want, or thought, and participate more fully in social interactions and conversations. Electronic communication devices can be used either by direct selection (e.g., accessing a keyboard by hand or by using a head pointer to send a light beam), or through scanning techniques.

9. Rowland, C., & Schweigert, P. (1991). The early communication process using microswitch technology (pp. 108-124). Portland, OR: Oregon Research Institute.

The section reviewed presents three case studies of students regarding the Early Communication Process (ECP). Emphasis throughout the case presentations is on assessment, intervention, data analysis, and reassessment. The ECP identifies several elements of communication and social interaction. A flowchart is described for intervention. Elements of ECP include: gaining attention; expressing interest in objects by using switches to activate them; requesting an object by direct action; requesting "more"; making choices using multiple switches or by directing an action toward an object; expressing preferences using signalling behaviors; making choices using symbols with multiple switches.

10. Steiner, S., & Larson, V. L. (1991). Integrating microcomputers into language intervention with children. Topics in Language Disorders, 11(2), 18-30.

The authors present 7 guidelines regarding the successful integration of computers into language intervention for children with disabilities. Four case studies are also presented, detailing the types of software used and specific applications with children.

The 7 guidelines include: (1) Focus of intervention--the clinician must first decide whether or not technology is appropriate; (2) Embedding computer activities--computer activities can be blended with other activities and integrated into the intervention program; (3) Theoretical considerations--the same principles should apply to uses of technology as they do to other forms of intervention; (4) Stimuli, responses, & reinforcements--evaluation should address appropriateness of stimuli, responses required by user, and reinforcements given to user; (5) Roles of client, aide, and clinician--decisions regarding

who is involved in computer activities and what the roles are of active participants (e.g., is the computer a surrogate clinician?); (6) Individualization--appropriate adaptations and selection of software; and, (7) Generic and designer software--"generic" refers to standard software adapted to meet individual language needs and "designer" refers to programs developed specifically for communication or language intervention.

11. Wacker, D.P., Wiggins, B., Fowler, M., & Berg, W.K. (1988). Training students with profound or multiple handicaps to make requests via microswitches. Journal of Applied Behaviors Analysis, 21(4): 331-343.

Three studies were conducted to evaluate the use of microswitches in indicating preferences and making requests. The first experiment was a replication of an earlier study conducted by Wacker, et al (1985) in which 5 students with profound or multiple disabilities used switches to activate various toys; data on duration of toy activations were collected to determine individual preference and define reinforcers. The 1988 replication study involved 5 students with profound, multiple disabilities, ranging from 13 to 20 years, who did not have any formal or reliable means to communicate. Switches used during the study were teacher-made plate switches and a mercury switch. Battery-operated objects consisted of a tape player, radio, fan, and toys that moved and made sound. Data was collected on the duration of switch activation for one of two objects. The results of this study did successfully replicate those of the 1985 study, and indicated that students activated switches longer for a highly preferred object. It was observed that for most of the students involved in the study, this was their first opportunity to independently engage in a desired activity.

In the second study, data was collected on the frequency of microswitch activation for purposes of social interaction. The switch was connected to a tape recorder which, when pressed, called for the teacher's attention. This study involved 9 students, 12 to 20 years, all of whom were identified as having profound mental retardation and no formal means of communication. Results indicated that students increased the frequency of switch activation when it was paired with social attention from the teacher, thus suggesting the importance of one's social environment.

In the third experiment, data was collected on the use of switches (as in the second study, switches were connected to a tape recorder) for requesting a specific activity (e.g., either a drink or playing in the classroom). Six students were involved. The results indicated that students used their microswitches to intentionally and meaningfully make a request of another person (e.g., "I want to drink juice, please."). These students, with their switches and tape recorders, were also able to use the setup in a local shopping mall, and generalized the skill so that they could order a drink from a fast-food restaurant.

The authors note the lack of empirical research on the use of microswitches and technology in general, as well as for communication training programs for students with profound or multiple disabilities. The use of microswitches by students in these studies provided a means for interaction and independence, control, and participation in typical, age-appropriate activities.

Microcomputers, Switch Access, & Environmental Control

1. Behrmann, M. M. (1984). A brighter future for early learning through high tech. The Pointer, 28(2), 23-26.

With the increase of technology in society, developers are beginning to focus attention on young children, as can be seen with the commercially available software marketed to this population (e.g., to teach colors, numbers, alphabet, matching shapes, etc.). Programs in the United States and Canada have begun teaching 2-, 3-, and 4-year olds computer-based activities. Yet, the use of computers as teaching tools for infants and toddlers remains a controversial issue. Regardless, most people feel that computers provide benefit as an interactive educational tool (versus television which is passive).

Most software used by students with disabilities is adapted from regular education courseware. In 1981, fewer than 10 of the 1,200 software titles were specifically for students with special educational needs). Special educators have stated a need for software that can be used to develop reading and language arts, computer literacy, social skills, and survival skills. Environmental control and increased independence have also been identified as great benefits of technology for young children with disabilities. Babies with disabilities have been involved in numerous studies, indicating their ability to use the computer for cause-effect, environmental control, and communication purposes.

2. Blackstone, S., Brown, C., Cavalier, A., Cress, C., Mineo, B., Sweig Wilson, M., & VanBiervliet, A. (1989). E. A. Lahm, (Ed.), Technology with low incidence populations: Promoting access to education and learning. Reston, VA: Center for Special Education Technology, The Council for Exceptional Children.

This paper is based on presentations of the June 1989 symposium sponsored by the Center for Special Education Technology. Research in technology for children with physical, sensory, and cognitive disabilities is presented. Physical access issues are presented and include strategies for adaptation. It is noted that adaptations made on one computer may not be transferred to another, resulting in problems moving from one system to another. The authors note a need to generalize the use of switches and interfaces for total access. Sensory aspects emphasize input and output access issues. Cognitive issues address the cognitive demands of certain hardware and software programs. Various studies are presented which support these concerns.

3. Cress, C. J. (1991). Design considerations for equal access to educational hardware and software. In C. J. Cress, C. C. Goltz, J. P. Tew, & G. J. French (Eds.), Cognitive access to computers: Selected research, design, and application papers. Madison, WI: Trace Reprint Series, Trace R & D Center, University of Wisconsin-Madison.

"Equal access" to computers and electronic devices implies the ability to use standard equipment that is available to all students (e.g., not just specialized equipment for the student with disabilities). Yet, the time and money required to use adaptive devices limits their applications in school settings. The goal should be to increase the "flexibility and availability of all standard computer systems at a reasonable cost without interfering with the existing uses and purposes of computer systems".

In 1985 a task force, coordinated through the Trace Center, was formed to develop and design a document to increase the accessibility of computers. The recommendations from this task force include areas of: (1) Physical Disability Issues; (2) Sensory Disability Issues; and, (3) Cross-Impairment Issues. As new innovations continue in the field of technology, these design considerations are revised. The aim is to increase coordination

between industry, consumers, educators, and rehabilitation personnel, and also to increase modifications of standard computer systems for "equal access" by users with disabilities.

4. Douglas, J., Reeson, B., and Ryan, M. (1988). Computer microtechnology for a severely disabled preschool child. Child: Care, Health, and Development, 14, 93-104.

Young children with severe disabilities can greatly benefit from the increased flexibility, reduced cost, and evolution of microcomputer technology. Computers can be used to maximize and enhance achievement at preschool and at home. Using technology early in a student's education can help decrease the chances of "learned helplessness" and passive behaviors, as well as misinterpretation of cognitive abilities (e.g., by increasing motivation; eliminating physical barriers).

A case report of an 3-year old boy is presented. Issues of concern, such as seating and switch positioning, must be addressed by a team of professionals. Prior to switch introduction, this boy did not have any means to control objects in his environment. Switches used by this child, including a voice-activated single switch and a mouth joystick, were all learned quickly and easily, and were used to access toys and computer software. After two years, by age 5, the child had learned to operate multiple switches (in array of 4), and was able to use the switches to independently operate his wheelchair and computer.

Switch use with battery-operated toys is primarily a recreational activity, and aside from promoting initial switch access, does not facilitate educational learning. However, the computer with appropriate software, adapted for input (e.g., with keyboard emulator), can promote cognitive development. It is noted that there is a need for further research to document the appropriateness of specific interventions.

5. Schweigert, P. (1988). Contingency intervention. In M. Bullis (Ed.), Communication development in young children with deaf-blindness: Literature review. Monmouth, OR: Teaching Research.

This chapter reviews several studies on contingency awareness with regard to microswitch and microcomputer technology for children with severe disabilities. In addition, computer programs and software systems are also described.

One study describes the impact of switch use on the ability of four students, with profound cognitive and physical disabilities, to turn on lights and/or music. Results indicated that the students were able to learn and discriminate contingencies. In another study, the frequency and duration of switch closure by two children with profound retardation was monitored; results demonstrated the children were both able to learn a targeted motor behavior to hit a switch, discriminate between reinforced and non-reinforced switch levers, and purposefully activate a switch to receive auditory reinforcement. A third study involving 3 children with moderate to severe disabilities and sensory impairments (one child with deaf-blindness), is cited regarding the feasibility of implementing switch-based environmental control devices at home. A microcomputer-assisted program (Contingency Intervention Curriculum) is reviewed and described to teach infants with severe disabilities problem solving. The Contingency Software System is described as software that addresses the first five stages of sensorimotor development and is controlled via switch input.

6. York, J., Nietupski, J., & Hamre-Nietupski, S. (1985). A decision-making process for using microswitches. Journal of the Association for Persons with Severe Handicaps. 10(4), 214-223.

Advances in technology, which can provide individuals with severe disabilities with immediate feedback, have greatly enhanced opportunities for environmental control, active participation, and choice-making. Several studies are cited which identify the uses of microswitches (e.g., to teach motor control; to indicate preference; etc.). Yet, it is noted that little information is available regarding guidelines for making decisions as to the appropriateness of technology and the process for implementing technology-based activities.

This paper presents a decision-making process which aims to help practitioners avoid mistakes regarding inappropriate use of microswitches. The process design stresses cooperative teamwork with teachers, therapists, and parents. There are 6 steps to the process: (1) Is the activity educationally valid?--is it age-appropriate; is it enjoyable for the student; can it be used in functional settings; is it important to the student and family; will it provide greater participation for the student; is it a means to an end?; (2) Can the activity be taught directly?--is individualized adaptation really necessary?; (3) Would a microswitch be appropriate?--is some other form of adaptation, such as non-electronic, more appropriate for the student?; (4) How should a program be developed?--considerations must address positioning, type of microswitch, instructional procedures, and data collection/monitoring; (5) Has a safety check been performed?--including voltage, wattage, etc.; and, (6) What are procedures for evaluation and revision?--does data indicate improvement in student's performance or accomplishment of goals?